PHYSICS

BOOKS - A2Z PHYSICS (HINGLISH)

GEOMETRICAL OPTICS

Reflection Through Plain And Spherical Mirror

1. A clock hung on a wall has marks instead of numerals in its dial. On the adjoining wall, there is a plane mirror and the image of the clock in the mirror indicates the time 4.20.

Then the time on the clock is

A. 7.40

B. 4.20

C. 2.40

D. 4.07

Answer: A

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2. An object is approaching a plane mirror at $10cms^{-1}$. A stationary observer sees the image. At what speed will the image approach the stationary observer ?

A. $10cms^{-1}$

B. $5cms^{-1}$

C. $20cms^{-1}$

D. $15cms^{-1}$

Answer: A

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3. What should be the angle between two plane mirrors so that whatever be the angle of incidence, the incident ray and the reflected ray from the two mirrors be parallel to each other

A. 60°

B. 90°

C. 120°

D. 175°

Answer: B

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4. A plane mirror is approaching you at a speed of $10cm / \sec$. You can see your image in it. At what speed will your image approach you?

A. $10cm / \sec$

B. $5cm / \sec$

C. $20cm / \sec$

D. $15cm / \sec$

Answer: C

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5. A ray of light is incident normally on a plane mirror. The angle of reflection will be

A. 0°

B. 90°

C. Will not be reflected

D. None of these

Answer: A

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6. A plane mirror makes an angle of 30° with horizontal. If a vertical ray strikes mirror, find the angle between mirror and reflected ray

A. 30°

B. 45°

C. 60°

D. 90°

Answer: C

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7. If an observer is walking away from the plane mirror with $6m/\sec$. Then the velocity of the image with respect to observer will be

A. $6m/\sec$

B. $-6m/\sec$

C. $12m/\sec$

D. $3m/\sec$

Answer: C

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8. A small object is placed $10cm$ in front of a plane mirror. If you stand behind the object $30cm$ from the mirror and look at its image, the distance focused for your eye will be

A. $60cm$

B. $20cm$

C. $40cm$

D. $80cm$

Answer: C

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9. An object is at a distance of $0.5m$ in front of a plane mirror. Distance between the object and image is

A. $0.5m$

B. $1m$

C. $0.25m$

D. $1.5m$

Answer: B

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10. A man runs towards a mirror at a speed $15m/s$. The speed of the image relative to the man is

A. $15ms^{-1}$

B. $30ms^{-1}$

C. $35ms^{-1}$

D. $20ms^{-1}$

Answer: B

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11. The light reflected by a plane mirror may form a real image

A. If the rays incident on the mirror are diverging

B. If the rays incident on the mirror are converging

C. If the object is placed very close to the mirror

D. Under no circumstances

Answer: B

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12. A ray of light is incident at 50° on the middle of one of the two mirrors arranged at an angle of 60° between them . The ray then touches the second mirror, get reflected back to the first mirror, making an angle of incidence of

A. 50°

B. 60°

C. 70°

D. 80°

Answer: C

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13. All of the following statements are correct except

A. The magnification produced by a convex mirror is always less than one

B. A virtual, erect, same-sized image can be obtained using a plane mirror

C. A virtual, erect, magnified image can be formed using a concave mirror

D. A real, inverted, same-sized image can be formed using a convex mirror

Answer: D

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14. A person sees his virtual image by holding a mirror very close to the face. When he moves the mirror away from his face, the image becomes inverted. What type of mirror he is using ?

A. Plane mirror

B. Convex mirror

C. Concave mirror

D. None of these

Answer: C

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15. A convex mirror of focal length f produced an image $(1/n)^{th}$ of the size of the object. The distance of the object from the mirror is

A. $(n-1)f$

B. $\left(\frac{n-1}{n}\right)f$

C. $\left(\frac{n+}{n}\right)f$

D. $(n+1)f$

Answer: A

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16. In a concave mirror experiment, an object is placed at a distance x_1 from the focus and the image is formed at a distance x_2 from the focus. The focal length of the mirror would be

A. $x_1 x_2$

B. $\sqrt{x_1 x_2}$

C. $\dfrac{x_1 + x_2}{2}$

D. $\sqrt{\dfrac{x_1}{x_2}}$

Answer: B

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17. The relation between the linear magnification m, the object distance u and the focal length f is

A. $m = \frac{f-u}{f}$

B. $m = \frac{f}{m-u}$

C. $m = \frac{f+u}{f}$

D. $m = \frac{f}{f+u}$

Answer: B

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18. Radius of curvature of concave mirror is $40cm$ and the size of image is twice as that of object, then the object distance is

A. $60cm$

B. $20cm$

C. $40cm$

D. $30cm$

Answer: D

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19. A convex mirror has a focal length f. A real object is placed at a distance f in front of it from the pole produces an image at

A. Infinity

B. f

C. $f/2$

D. $2f$

Answer: C

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20. An object $1cm$ tall is placed $4cm$ in front of a mirror. In order to produce an upright image of $3cm$ height one needs a

A. Convex mirror or radius of curvature $12cm$

B. Concave mirror of radius of curvature $12cm$

C. Concave mirror of radius of curvature $4cm$

D. Plane mirror of height $12cm$

Answer: B

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21. A point object is placed at a distance of 10 cm and its real image is formed at a distance of 20 cm from a concave mirror. If the object is moved by 0.1 cm towards the mirror. The image will shift by about

A. $0.4cm$ away from the mirror

B. $0.4cm$ towards the mirror

C. $0.8cm$ away from the mirror

D. $0.8cm$ towards the mirror

Answer: A

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22. Under which of the following conditions will a convex mirror of focal length f produce an image that is erect, diminished and virtual ?

A. Only when $2f > u > f$

B. Only when $u = f$

C. Only when $u < f$

D. Always

Answer: D

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23. The focal length of a convex mirror is $20cm$ its radius of curvature will be

A. $10cm$

B. $20cm$

C. $30cm$

D. $40cm$

Answer: D

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24. A concave mirror of focal length $15cm$ forms an image having twice the linear dimensions of the object. The position of the object when the image is virtual will be

A. $22.5cm$

B. $-7.5cm$

C. $30cm$

D. $45cm$

Answer: B

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25. A point object is placed at distance of 30 cm from a convex mirror of local length 30 cm. The image will form at

A. Infinity

B. Focus

C. Pole

D. $15cm$ behind the mirror

Answer: D

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26. An object $2.5cm$ high is placed at a distance of $10cm$ from a concave mirror of radius of curvature $30cm$. The size of the image is

A. $9.2cm$

B. $10.5cm$

C. $5.6cm$

D. $7.5cm$

Answer: D

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27. Image formed by a concave mirror of focal length $6cm$, is 3 times of the object, then the distance of object from mirror is

A. $-4cm$

B. $8cm$

C. $6cm$

D. $12cm$

Answer: A

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28. A concave mirror has a focal length $20cm$. The distance between the two positions of the object for which the image size is double of the object size is

A. $20cm$

B. $40cm$

C. $30cm$

D. $60cm$

Answer: A

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29. With a concave mirror, an object is placed at a distance x_1 from the principal focus, on the principal axis. The image is formed at a distance x_2 from the principal focus. The focal length of the mirror is

A. x_1x_2

B. $\frac{x_1 + x_2}{2}$

C. $\sqrt{\frac{x_1}{x_2}}$

D. $\sqrt{x_1 x_2}$

Answer: D

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30. A convex mirror has a focal length of $20cm$. A real object is placed at a distance of $20cm$ in front of the mirror form the pole. The mirror produces the image at

A. infinity

B. $20cm$

C. $40cm$

D. $10cm$

Answer: D

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31. An object $3cm$ tall is placed on the principal axis of a concave mirrorr of focal length $9cm$ at a distance of $12cm$ form is.

What is the nature and size of the image ?

A. real, $9cm$

B. virtual, $9cm$

C. real , $1cm$

D. virtual, $1cm$

Answer: A

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32. An object $5cm$ tall is placed $10cm$ form a convex mirror of radius of curvature $30cm$. What is the nature and size of the image ?

A. real, $3cm$

B. virtual, $7.5cm$

C. virtual, $3cm$

D. real, $7.5cm$

Answer: C

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33. A spherical mirror forms an image of magnification 3. The object distance, if focal length of mirror is $24cm$, may be

A. $32cm, 24cm$

B. $32cm, 16cm$

C. $32cm$ only

D. $16cm$ only

Answer: B

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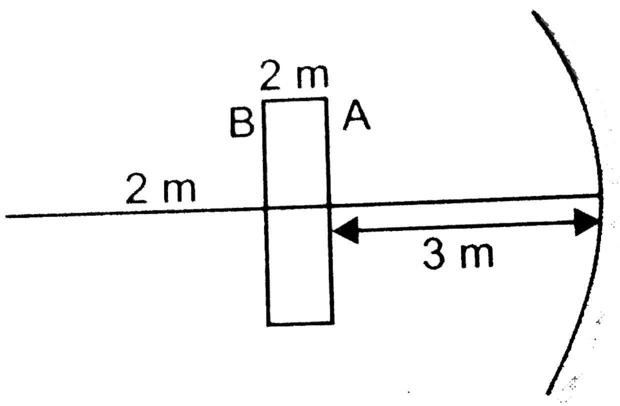
34. A cube of side $2m$ is placed in front of a concave mirror of focal length $1m$ with its face A at a distance of $3m$ and face B at a distance of $5m$ form the mirror, The distance between the images of face A and B and height of images of A and B are respectively.



A. $1m$, 0.5, $0.25m$

B. $0.5m, 1m, 0.25m$

C. $0.5m, 0.25m, 1n$

D. $0.25m, 1m, 0.5m$

Answer: D

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35. An object is placed at a distance $2f$ from a concave mirror of focal length f. Light reflected from the mirror falls on a plane mirror. The distance of the plane mirror from the concave mirror equals f. The distance of the final image (due to reflection at both concave and plane mirror) from the concave mirror is

A. f

B. $f/2$

C. $2f$

D. zero

Answer: D

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36. A convergent beam of light converges to a point $20cm$ behind the convex mirror on the principal axis. An inverted image of the same size is formed coincident with the virtual object. Then, the focal length of the convex mirror is

A. $20cm$

B. $10cm$

C. $40cm$

D. $30cm$

Answer: B

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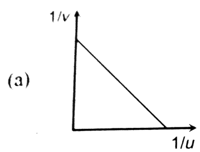
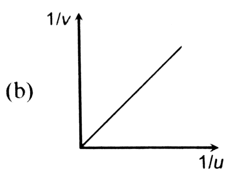
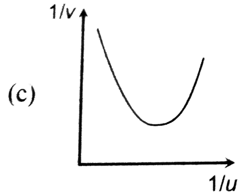
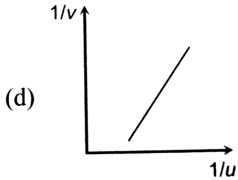
37. For a concave mirror, if real image is formed the graph between $\frac{1}{u}$ and $\frac{1}{v}$ is of the form

A. 

B. 

C. 

D. 

Answer: A

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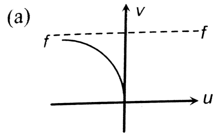
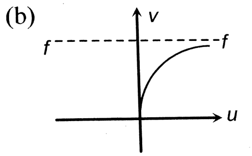
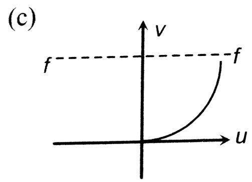
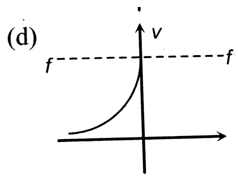
38. The graph between u and v for a convex mirrorr is

A. 

B. 

C. 

D. 

Answer: A

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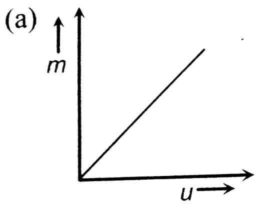
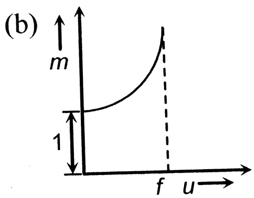
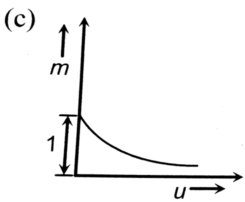
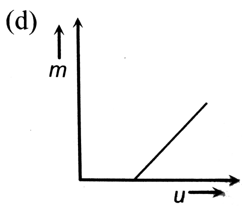
39. For a concave mirrorr, if virtual image is formed, the graph between m and u is of the form

A. 

B. 

C. 

D. 

Answer: B

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40. A mark is made on the bottom of a vessel and over this mark, a glass slab to thickness $3.5cm$ and refractive index $\frac{7}{4}$ is placed. Now water (refractive index, $\frac{4}{3}$) is poured into the vessel so that the surface of water is $8cm$ above the upper surface of the slab. Looking down of normally through the water, the apparent depth of the mark below the surface of water will be :

A. $6.33cm$

B. $7.5cm$

C. $8cm$

D. $10cm$

Answer: C

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41. How much water should be filled in a container of height $21cm$, so that it appears half filled to the observer when viewed from the top of the container $(\mu = 4/3)$.

A. $8.0cm$

B. $10.5cm$

C. $12.0cm$

D. None of the above

Answer: C

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42. A beam of light is converging towards a point I on a screen. A plane glass plate whose thickness in the direction of the beam $= t$, refractive index $= \mu$, is introduced in the path of the beam. The convergence point is shifted by

A. $t\left(1 - \frac{1}{\mu}\right)$ away

B. $t\left(1 + \frac{1}{\mu}\right)$ away

C. $t\left(1 - \frac{1}{\mu}\right)$ nearer

D. $t\left(1+\frac{1}{\mu}\right)$ nearer

Answer: A

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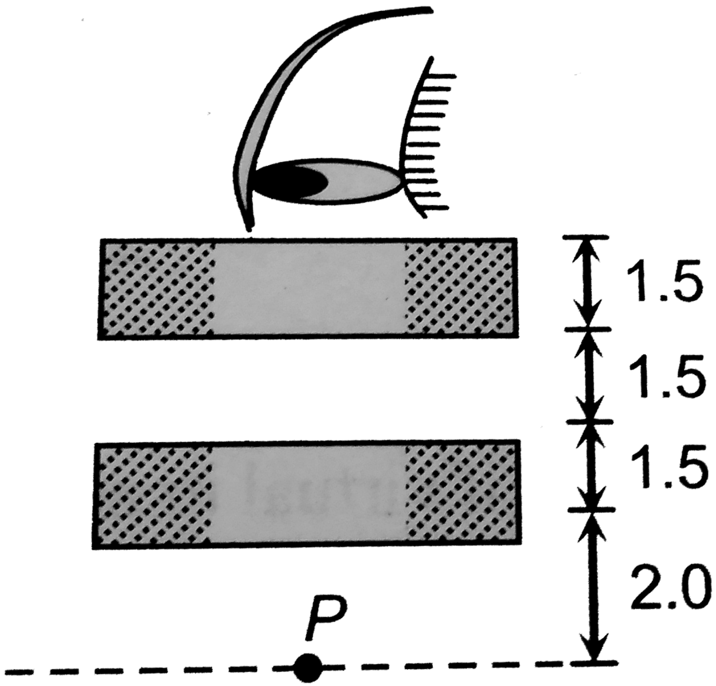
43. The image of point P when viewed from top of the slabs will be



A. $2.0cm$ above P

B. $1.5cm$ above P

C. $2.0cm$ below P

D. $1cm$ above P

Answer: D

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44. The length of the optical path of two media in contact of length d_1 and d_2 of refreactive indices μ_1 and μ_2 respectively, is

A. $\mu_1 d_1 + \mu_2 d_2$

B. $\mu_1 d_2 + \mu_2 d_1$

C. $\dfrac{d_1 d_2}{\mu_1 \mu_2}$

D. $\dfrac{d_1 + d_2}{\mu_1 \mu_2}$

Answer: A

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45. When light travels from air to water and from water to glass, again from glass to CO_2 gas and finally through air. The relation between their refractive indices will be given by

A. $._a n_w \times ._w n_{gi} \times ._{gi} n_{gas} \times ._{gas} n_a = 1$

B. $._a n_w \times ._w n_{gi} \times ._{gas} n_{gi} \times ._{gi} n_a = 1$

C. $._a n_w \times ._w n_{gi} \times ._{gi} n_{gas} = 1$

D. There is no such relation

Answer: A

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46. A mark at the bottom of a liquid appears to rise by $0.1m$. The depth of the liquid is $1m$. The refractive index of the liquid is

A. 1.33

B. $\frac{9}{10}$

C. $\frac{10}{9}$

D. 1.5

Answer: C

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47. If $\hat{i}$ denotes a unit vector along incident light ray, $\hat{r}$a unit vector along refracted ray into a medium of refraction index μ and $\hat{n}$ unit vector normal to boundary of medium directed towards incident medium, then law of refraction is

A. $\hat{i}\,.\,\widehat{n} = \mu(\hat{r}\,.\,\widehat{n})$

B. $\hat{i} \times \widehat{n} = \mu(\widehat{n} \times \hat{r})$

C. $\hat{i} \times \widehat{n} = \mu(\hat{r} \times \widehat{n})$

D. $\mu(\hat{r} \times \widehat{n}) = \hat{r} \times \widehat{n}$

Answer: C

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48. Each quarter of a vessel of depth H is filled with liquids of the refractive indices n_1, n_2, n_3 and n_4 from the bottom respectively. The apparent depth of the vessel when looked normally is

A. $\dfrac{H(n_1+n_2+n_3+n_4)}{4}$

B. $\dfrac{H\left(\frac{1}{n_1}+\frac{1}{n_2}+\frac{1}{n_3}+\frac{1}{n_4}\right)}{4}$

C. $\dfrac{(n_1+n_2+n_3+n_4)}{4H}$

D. $\dfrac{h\left(\frac{1}{n_1}+\frac{1}{n_2}+\frac{1}{n_3}+\frac{1}{n_4}\right)}{2}$

Answer: B

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49. Refractive index of air is 1.0003. The correct thickness of air column which will have one more wavelength of yellow light (6000Å) than in the same thickness in vacuum is

A. $2mm$

B. $2cm$

C. $2m$

D. $2km$

Answer: A

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50. A glass slab of thickness $3cm$ and refractive index $3/2$ is placed on ink mark on a piece of paper. For a person looking at the mark at a distance $5.0cm$ above it, the distance of the mark will appear to be

A. $3.0cm$

B. $4.0cm$

C. $4.5cm$

D. $5.0cm$

Answer: B

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51. A fish at a depth of $12cm$ in water is viewed by an observer on the bank of a lake. To what height the images of the fish is raised ?

A. $9cm$

B. $12cm$

C. $3.8cm$

D. $3cm$

Answer: D

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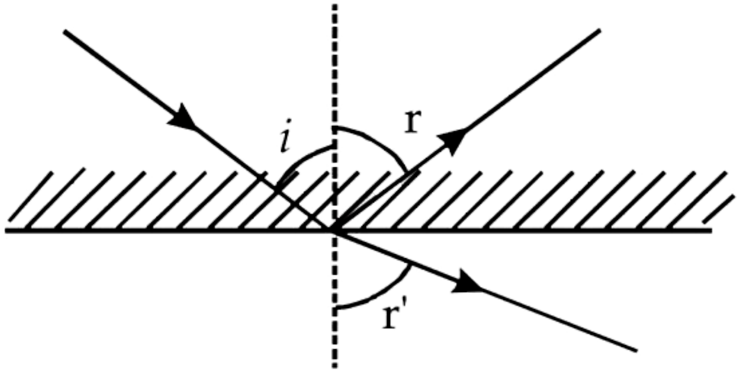

52.

A ray of light from a denser medium strike a rarer medium at an angle of incidence I (see Fig). The reflected and refracted rays make as angle of 90degrees with each other. The angles of reflection and refraction are r and r The critical angle is

A. $\sin^{-1}(\sin r)$

B. $\sin^{-1}(\tan r')$

C. $\sin^{-1}(\tan i)$

D. $\tan^{-1}(\sin i)$

Answer: C

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53. A diver in a swimming poole wants to signal his distress to a person lying on the edge of the pool by flashing his water proof flash light

A. He must direct the beam vertically upwards

B. He has to direct the beam horizontally

C. He has to direct the beam at an angle to the vertical which is slightly less than the cirtical angle of incidence for total internal reflection.

D. He has to direct the beam at an angle to the vertical which is slightly more than the critical angle of incidence for the total internal reflection.

Answer: C

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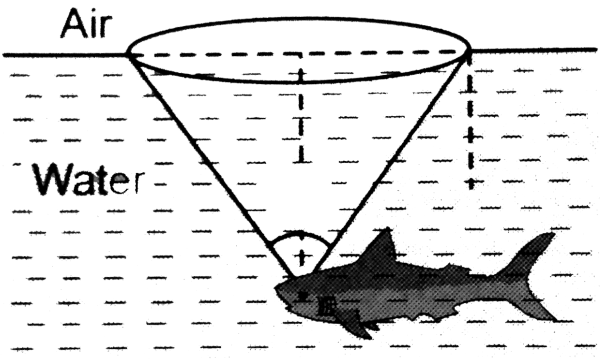
54. A fish is a little away below the surface of a lake. If the critical angle is 49°, then the fish could see things above the water surface with in an angular range of θ° where



A. $\theta = 49^{\circ}$

B. $\theta = 90^{\circ}$

C. $\theta = 90^{\circ}$

D. $\theta = 24\frac{1}{2}^{\circ}$

Answer: C

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55. For total internal reflection to take place, the angle of incidence i and the refractive index μ of the medium must satisfy the inequality

A. $\frac{1}{\sin i} < \mu$

B. $\frac{1}{\sin i} > \mu$

C. $\sin i < \mu$

D. $\sin i > \mu$

Answer: A

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56. With respect to air critical angle in a medium for light of red colour $[\lambda_1]$ is θ. Other facts remaining same, critical angle for light of yellow colour $[\lambda_2]$ will be

A. θ

B. More than θ

C. Less than θ

D. $\frac{\theta\lambda_1}{\lambda_2}$

Answer: C

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57. The velocity of light in a medium is half its velocity in air. If ray of light emerges from such a medium into air, the angle of incidence, at which it will be totally internally reflected, is

A. 15°

B. 30°

C. 45°

D. 60°

Answer: B

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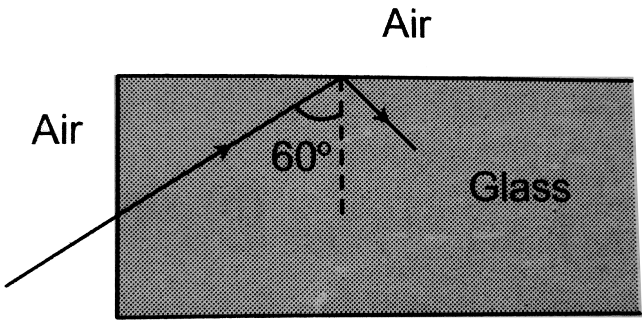
58. A light ray from air is incident (as shown in figure) at one end of a glass fiber (refractive index $\mu = 1.5)$ making an incidence angle of 60° on the lateral surface, so that it undergoes a total internal reflection. How much time would it take to traverse the straight fiber of length $1km$?



A. $3.33m$ sec

B. $6.67m$ sec

C. $5.77m$ sec

D. 3.85μ sec

Answer: D

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59. Light wave enters from medium 1 to medium 2. Its velocity in 2^{nd} medium is double from 1^{st}. For total internal reflection, the angle of incidence must be greater than

A. 30°

B. 60°

C. 45°

D. 90°

Answer: A

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60. Glass has refractive index μ with respect to air and the critical angle for a ray of light going from glass to air is θ. If a ray of light is incident from air on the glass with angle of incidence θ, the corresponding angle of refraction is

A. $\sin^{-1}\left(\frac{1}{\sqrt{\mu}}\right)$

B. 90°

C. $\sin^{-1}\left(\frac{1}{\mu^2}\right)$

D. $\sin^{-1}\left(\frac{1}{\mu}\right)$

Answer: C

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61. Material A has critical angle i_A, and material B has critical angle $i_B (i_B > i_A)$. Then which of the following is true

(i) Light can be totally internally reflected when it passes from B to A

(ii) Light can be totally internally relected when it passes from A to B

(iii) Critical angle for total internal reflection is

$i_B - i_A$

(iv) Critical angle between A and B is

$\sin^{-1}\left(\frac{\sin i_A}{\sin i_B}\right)$

A. (i) and (iii)

B. (i) and (iv)

C. (ii) and (iii)

D. (ii) and (iv)

Answer: D

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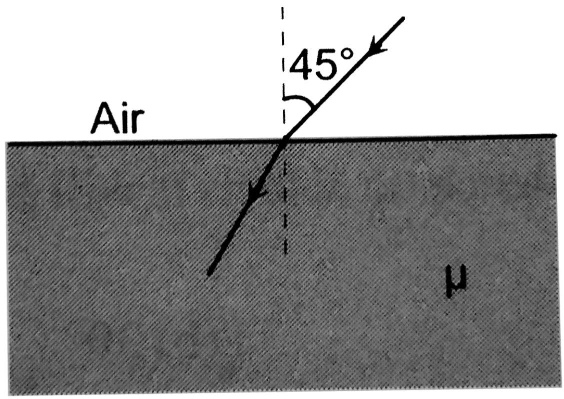
62. In the figure shown , for an angle of incidence 45°, at the top surface , what is the minimum refractive index needed for the internal reflection at vertical face ?



A. $\dfrac{\sqrt{2}+1}{2}$

B. $\sqrt{\frac{3}{2}}$

C. $\sqrt{\frac{1}{2}}$

D. $\sqrt{2}+1$

Answer: B

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63. If light travels a distance x in t_1 sec in air and $10x$ distance in t_2 sec in a medium, the critical angle of the medium will be

A. $\tan^{-1}\left(\frac{t_1}{t_2}\right)$

B. $\sin^{-1}\left(\frac{t_1}{t_2}\right)$

C. $\sin^{-1}\left(\frac{10t_1}{t_2}\right)$

D. $\tan^{-1}\left(\frac{10t_1}{t_2}\right)$

Answer: C

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64. A ray of light passes from glass having a refractive index of $1.6,$ to air. The angle of incidence for which the angle of refraction is twice the angle of incidence is

A. $\sin^{-1}\left(\frac{4}{5}\right)$

B. $\sin^{-1}\left(\frac{3}{5}\right)$

C. $\sin^{-1}\left(\frac{5}{8}\right)$

D. $\sin^{-1}\left(\frac{2}{5}\right)$

Answer: B

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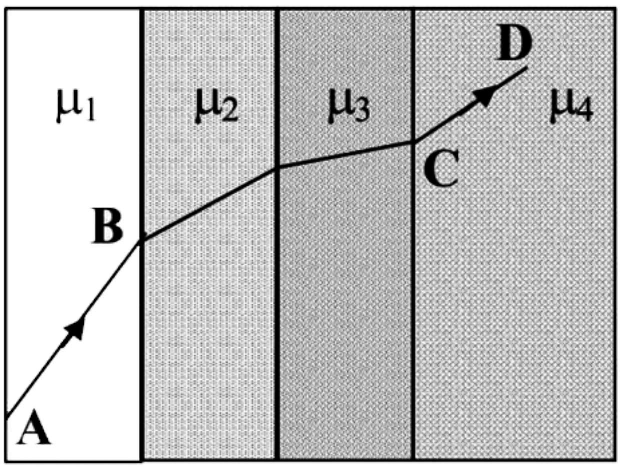
65. A ray of light passes through four transparent media with refractive indices μ_1,μ_2 ,μ_3 and μ_4 as shown in the figure. The surfaces of all media are parallel. If the emergent ray CD is parallel to the incident ray AB, we must have



A. $\mu_1 = \mu_2$

B. $\mu_2 = \mu_3$

C. $\mu_3 = \mu_4$

D. $\mu_4 = \mu_1$

Answer: D

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66. A beam of white light is incident on glass air interface from glass to air such that green light just suffers total internal reflection. The colors of the light which will come out to air are

A. Yellow, orange, red

B. Violet, indigo, blue

C. All colours

D. All colours except green

Answer: A

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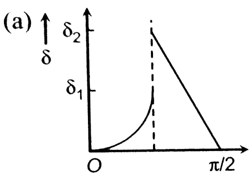
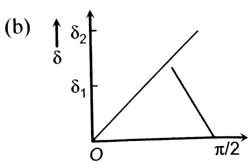
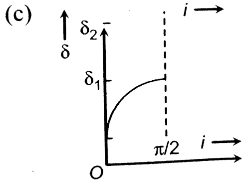
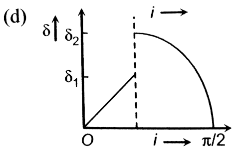
67. A ray of light travels from a medium of refractive index μ to air. Its angle of incidence in the medium is i, measured from the normal to the boundary , and its angle of deviation is δ. δ is plotted against i. Which of the following best represents the resulting curve ?

A. 

B. 

C. 

D. 

Answer: A

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68. The graph between sine of angle of refraction $(\sin r)$ in medium 2 and sine of angle of incidence $(\sin i)$ in medium indicates that $\left(\tan 36^{\circ} \approx \frac{3}{4}\right)$

A. Total internal reflection can take place

B. Total internal reflection cannot take place

C. Any of (a) and (b)

D. Data is incomplete

Answer: B

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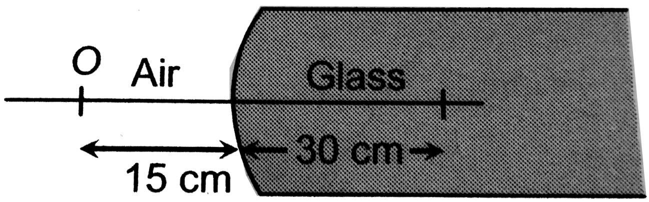
1. A point object O is placed in front of a glass rod having spherical end of radius of curvature $30cm$. The image would be formed at



A. $30cm$ left

B. Infinity

C. $1cm$ to the right

D. $18cm$ to the left

Answer: A

Watch Video Solution

2. Refraction takes place at a concave spherical boundary separating glass air medium. For the image to be real, the object distance $(\mu_g = 3/2)$

A. should be greater than three times the radius of curvature of refracting surface

B. should be greater than two times the radius of curvature of the refracting surface

C. should be greater than the radius of curvature of refracting surface

D. is independent of the radius of curvature of the refracting surface

Answer: A

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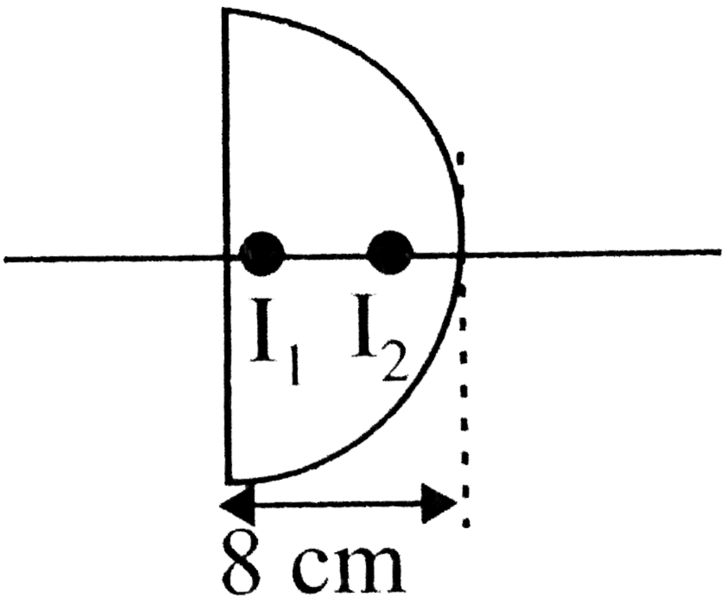
3. A plastic hemisphere has a radius of curvature of $8cm$ and an index of refraction of 1.6 . On the axis halfway between the plane surface and the spherical one $(4cm$from each$)$ is a small object O.

The distance between the two images when viewed along the axis from the two sides of the hemisphere is approximately



A. $1.0cm$

B. $1.5cm$

C. $3.75cm$

D. $2.5cm$

Answer: D

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4. A point object is placed at the centre of a glass sphere of radius 6cm and refractive index 1.5. The distance of virtual image from the surface is

A. $2cm$

B. $4cm$

C. $6cm$

D. $12cm$

Answer: C

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5. A spherical surface of radius of curvature R separates air (refractive index 1.0) from glass (refractive index 1.5). The centre of curvature is in the glass. A point object P placed in air is found to have a real image Q in the glass. The line PQ cuts the surface at a point O, and $PO = OQ$. The distance PO

A. $5R$

B. $3R$

C. $2R$

D. $1.5R$

Answer: A

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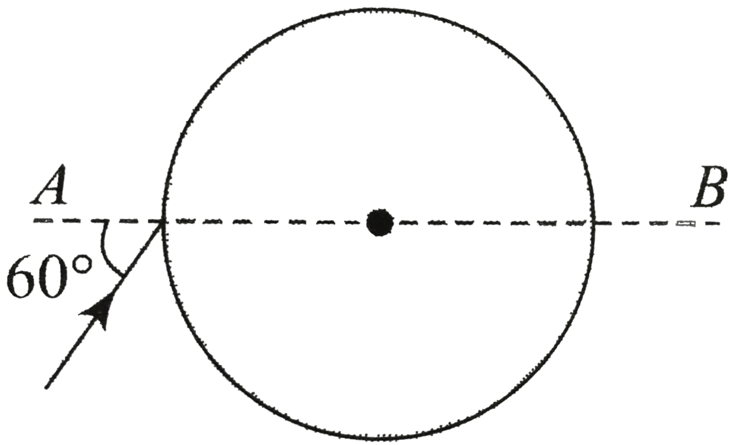
6. A ray of light falls on a transparent sphere with center at C as shown in Figure . The ray emerges from the sphere parallel to line AB. Find the refractive index of the sphere.



A. $\sqrt{2}$

B. $\sqrt{3}$

C. $3/2$

D. $1/2$

Answer: B

Watch Video Solution

7. A ray of light in incident on a glass sphere of refractive index $3/2$. What should be the angle of incidence so that the ray which enters the sphere does not come out of the sphere ?

A. $\tan^{-1}(2/3)$

B. 60°

C. 90°

D. 30°

Answer: C

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8. A convex lens of focal length f is placed somewhere in between an object and a screen. The distance between the object and the screen is x. If the numerical value of the magnification produced by the lens is m, then the focal lnegth oof the lens is .

A. $\frac{mx}{(m+1)^2}$

B. $\frac{mx}{(m-1)^2}$

C. $\frac{(m+1)^2}{m}x$

D. $\frac{(m-1)^2}{m}x$

Answer: A

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9. A thin lens focal length f_1 and its aperture has diameter d. It forms an image of intensity I. Now the central part of the aperture up to diameter $\frac{d}{2}$ is blocked by an opaque paper. The focal length and image intensity will change to

A. $\frac{f}{2}$ and $\frac{I}{2}$

B. f and $\frac{I}{4}$

C. $\frac{3f}{4}$ and $\frac{I}{2}$

D. f and $\frac{3I}{4}$

Answer: D

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10. A lens of power $+2$ dioptres is placed in contact with a lens of power -1 dioptre. The combination will behave like

A. A convergent lens of focal length $50cm$

B. A divergent lens of focal length $100cm$

C. A convergent lens of focal length $100cm$

D. A convergent lens of focal length $200cm$

Answer: C

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11. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is

A. $-1.5D$

B. $-6.5D$

C. $+6.5D$

D. $+6.67D$

Answer: A

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12. Two lenses are placed in contact with each other and the focal length of combination is $80cm$. If the focal length of one is $20cm$, then the power of the other will be

A. $1.66D$

B. $4.00D$

C. $-1.00D$

D. $-3.75D$

Answer: D

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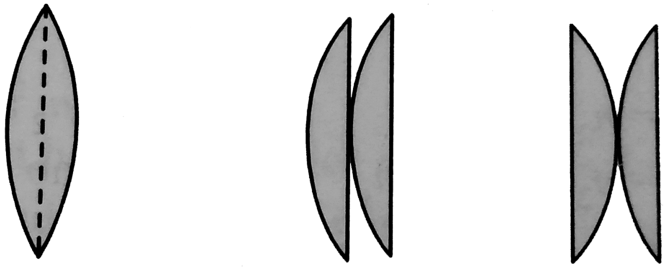
13. Two similar planoconvex lenses are combined together in three different ways as shown in the adjoining figure. The ratio of the focal lengths in three cases will be



A. $2 : 2 : 1$

B. $1 : 1 : 1$

C. $1 : 2 : 2$

D. $2 : 1 : 1$

Answer: B

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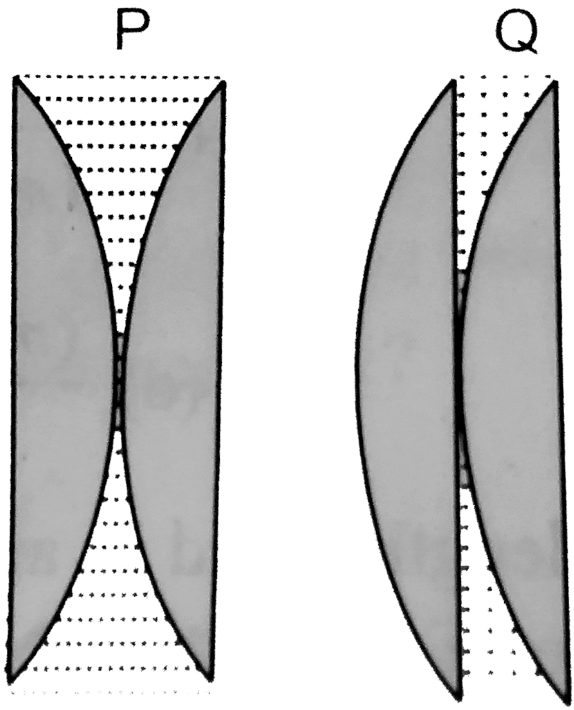
14. Two convex lenses of powers $4D$ and $6D$ are separated by a distance of $\frac{1}{6}m$. The power of the optical system so formed is



A. $-6D$

B. $+6D$

C. $10D$

D. $2D$

Answer: B

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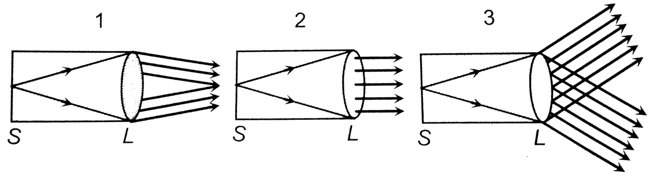
15. The slit of a collimator is illuminated by a source as shown in the adjoining figures. The distance between the slit S and the collimating lengs L is equal to the focal length of the lens. The correct direction of the emergent beam will be as shown in figure.



A. 1

B. 3

C. 2

D. None of the figures.

Answer: C

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16. A converging lens is used to form an image on a screen. When the upper half of the lens is covered by an opaque screen

A. Half the image will disappear

B. Complete image will be formed of same intensity

C. Half image will be formed of same intensity

D. Complete image will be formed of decreased intensity.

Answer: D

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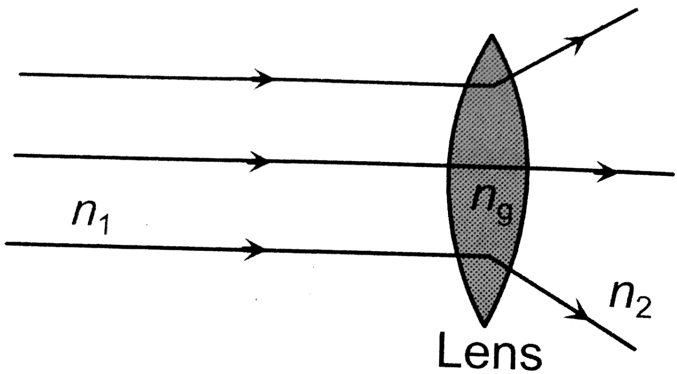
17. The ray diagram could be correct



A. If $n_1 = n_2 = n_3$

B. If $n_1 = n_2$ and $n_1 < n_g$

C. If $n_1 = n_2$ and $n_1 > n_g$

D. Under no circumstances

Answer: C

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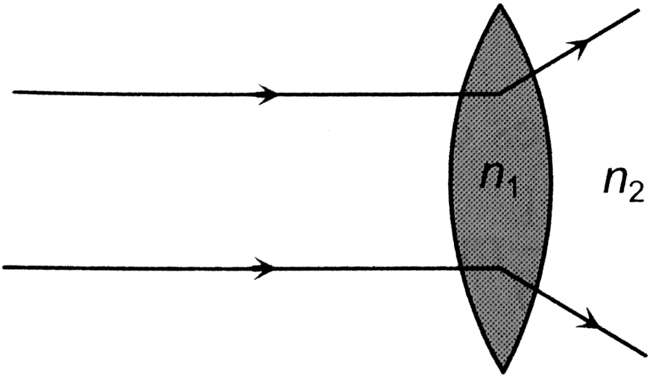
18. The relation between n_1 and n_2, if behavior of light rays is as shown in figure is



A. $n_1 > \quad > n_2$

B. $n_2 > n_1$

C. $n_1 > n_2$

D. $n_1 = n_2$

Answer: B

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19. The minimum distance between an object and its real image formed by a convex lens is

A. $1.5f$

B. $2f$

C. $2.5f$

D. $4f$

Answer: D

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20. An object is placed at a distance of $f/2$ from a convex lens. The image will be

A. At one of the foci, virtual and double its size

B. At $3f/2$, real and inverted

C. At $2f$, virtual and erect

D. None of these

Answer: A

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21. A biconvex lens forms a real image of an object placed perpendicular to its principal axis. Suppose the radii of curvature of the lens tend to infinity. Then the image would

A. Disappear

B. Remain as real image still

C. Be virtual and of the same size as the object

D. Suffer from aberrations

Answer: C

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22. A lens is placed between a source of light and a wall. It forms images of area A_1 and A_2 on the wall for its two different positions. The area of the source of light is

A. $\dfrac{A_1 + A_2}{2}$

B. $\left[\dfrac{1}{A_1} + \dfrac{1}{A_2}\right]^{-1}$

C. $\sqrt{A_1 A_2}$

D. $\left[\frac{\sqrt{A_1}+\sqrt{A_2}}{2}\right]^2$

Answer: C

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23. A combination of two thin lenses with focal lengths f_1 and f_2 respectively forms and image of distant object at distance $60cm$ when lenses are in contact. The position of this image shifts by $30cm$ towards the combination when two lenses are separated by $10 cm$. The corresponding values of f_1 and f_2 are

A. $30 cm, \; -60 cm$

B. $20 cm, \; -30 cm$

C. $15 cm, \; -20 cm$

D. $12 cm, \; -15 cm$

Answer: B

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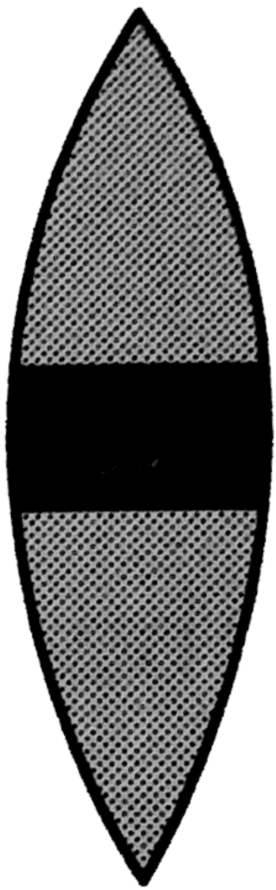
24. If the central portion of a convex lens is wrapped in black paper as shown in figure



A. No image will be formed by the remaining portion of the lens

B. The full image be formed but it will be less bright

C. The central portion of the image will be missing

D. There will be two images each produced by one of the exposed portions of the lens.

Answer: B

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25. A diminished image of an object is to be obtained on a screen 1.0 m from it. This can be achieved by appropriately placing

A. A convex mirrorr of suitable focal length

B. A concave mirrorr of suitable focal length

C. A concave lens of suitable focal length

D. A convex lens of suitable focal length less than $0.25m$

Answer: D

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26. In figure, an air lens of radius of curvature of each surface equal to $10cm$ is cut into a cylinder of glass of refractive index 1.5. The focal length and the nature of lens are

A. $15cm$, concave

B. $15cm$, convex

C. ∞ neither concave nor convex

D. 0, concave

Answer: A

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27. A lens (focal length $50cm$) forms the image of a distant object which subtends an angle of 2 milliradian at the lens. What is the size of the image ?

A. $5mm$

B. $1mm$

C. $0.5mm$

D. $0.1mm$

Answer: C

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28. A convex lens of focal length $12cm$ is made of glass of $\mu = \frac{3}{2}$. What will be its focal length when immersed in liquid of $\mu = \frac{5}{4}$?

A. $6cm$

B. $12cm$

C. $24cm$

D. $30cm$

Answer: D

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29. A concave lens of glass, refractive index 1.5 has both surfaces of same radius of curvature R. On immersion in a medium of refractive index 1.75, it will behave as a

A. Convergent lens of focal length $3.5R$

B. Convergent lens of focal length $3.0R$

C. Divergent lens of focal length $3.5R$

D. Divergent lens of focal length $3.0R$

Answer: A

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30. A convex lens if in contact with concave lens. The magnitude of the ratio of their focal length is $\frac{2}{3}$. Their equivalent focal length is 30 cm. What are their individual focal lengths?

A. $-75, 50$

B. $-10, 15$

C. $75, 50$

D. $-15, 10$

Answer: D

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31. An equiconvex lens of glass of focal length 0.1 meter is cut along a plane perpendicular to principle axis into two equal parts. The ratio of focal length of new lenses forms is

A. $1 : 1$

B. $1 : 2$

C. $2 : 1$

D. $2 : \frac{1}{2}$

Answer: A

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32. A thin lens made of a material of refractive index μ_0 has a focal length f_0 in air. Find the focal length of this lens if it is immersed in a liquid of refractive index μ.

A. $-\frac{fn'(n-1)}{n'-n}$

B. $-\frac{fn'(n-1)}{n(n'-n)}$

C. $-\frac{n'(n-1)}{f(n'-n)}$

D. $\frac{fn'n}{n-n'}$

Answer: A

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33. A thin made of glass of refractive index 1.5 has a front surface $+11D$ power and back surface $-6D$. If this lens is submerged in a liquid of refractive index 1.6, the resulting power of the lens is

A. $-0.5D$

B. $+0.5D$

C. $-0.625D$

D. $+0.625D$

Answer: C

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34. Let f_v and f_r are the focal lengths of a convex lens for violet and red lights respectively. If F_v and F_r are the focal lengths of a concave lens for violet and red light respectively, then

A. $f_v < f_r$ and $F_v > F_r$

B. $f_v < f_r$ and $F_v < F_r$

C. $f_c > f_r$ and $F_v > F_r$

D. $f_v > f_r$ and $F_v < F_r$

Answer: B

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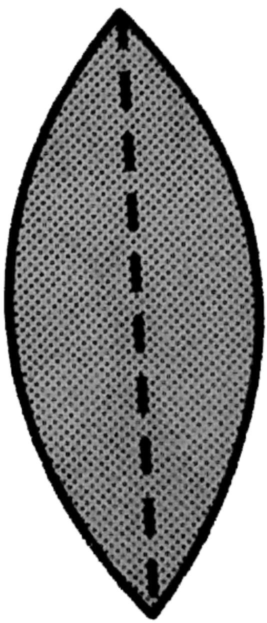
35. A convex lens has a focal length f. It is cut into two parts along the dotted line as shown in figure. The focal length of each part will be



A. $\frac{f}{2}$

B. f

C. $\frac{3}{2}f$

D. $2f$

Answer: D

Watch Video Solution

36. A concave lens forms the image of an object such that the distance between the object and image is $10cm$ and the magnification produced is $1/4$. The focal length of the lens will be

A. $8.6cm$

B. $6.2cm$

C. $10cm$

D. $4.4cm$

Answer: D

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37. An object has image thrice of its original size when kept at $8cm$ and $16cm$ from a convex lens. Focal length of the lens is

A. $8cm$

B. $16cm$

C. Between $8cm$ and $16cm$

D. Less than $8cm$

Answer: C

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38. A convex lens produces a real image m times the size of the object. What will be the distance of the object from the lens ?

A. $\left(\frac{m+1}{m}\right)f$

B. $(m-1)f$

C. $\left(\frac{m-1}{m}\right)f$

D. $\frac{m+1}{f}$

Answer: A

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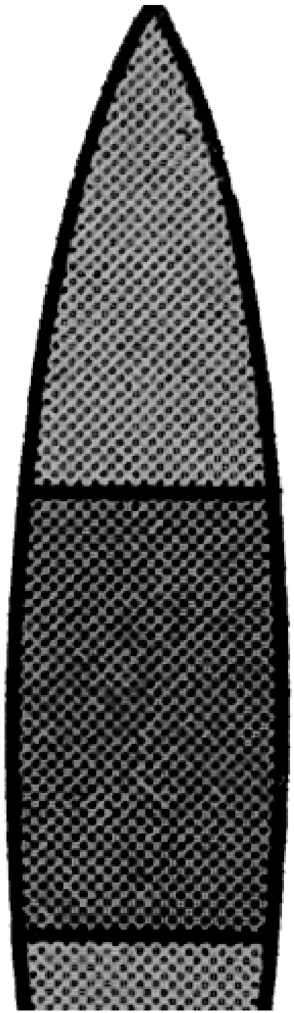
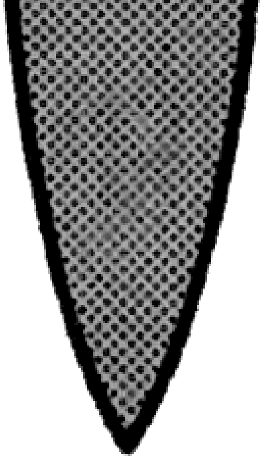
39. A convex lens is made up of three different materials as shown in the figure. For a point object placed on its axis, the number of images formed are





A. 1

B. 5

C. 4

D. 3

Answer: D

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40. An object is placed $12cm$ to the left of a converging lens of focal length $8cm$. Another converging lens of $6cm$ focal length is placed at a distance of $30cm$ to the right of the first lens. The second lens will produce

A. No image

B. A virtual enlarged image

C. A real enlarged image

D. A real smaller image

Answer: C

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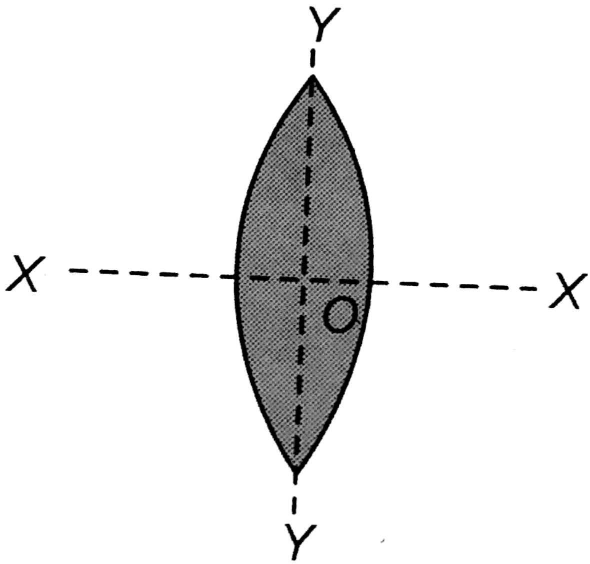
41. An equiconvex lens is cut into two halves along $(i) XOX'$ and $(ii) YOY'$ as shown in the figure. Let $f, f' f''$ be the focal lengths of the complete lens, of each half in case (i), and of each half in case (ii), respectively

Choose the correct statement from the

following



A. $f' = 2f, f'' = f$

B. $f' = f, f'' = f$

C. $f' = 2f, f'' = 2f$

D. $f' = f, f'' = 2f$

Answer: D

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42. A magnifying glass is to be used at the fixed object distance of 1 inch. If it is to produce an erect image magnified 5 times its focal length should be

A. 0.2 inch

B. 0.8 inch

C. 1.25 inch

D. 5 inch

Answer: C

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43. An object is kept at a distance of $16cm$ from a thin lens and the image formed is real. If the object is kept at a distance of $6cm$ from the lens, the image formed is virtual. If the sizes of the images formed are equal, the focal length of the lens will be

A. $15cm$

B. $17cm$

C. $21cm$

D. $11cm$

Answer: D

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44. An object placed $10cm$ in front of a lens has an image $20cm$ behind the lens. What is the power of the lens(in diopters) ?

A. 1.5

B. 3.0

C. -15.0

D. $+15.0$

Answer: D

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45. Two lenses of power $+12$ and -2 diopters are placed in contact. The combined focal length of the combination will be

A. $8.33cm$

B. $1.66cm$

C. $12.5cm$

D. $10cm$

Answer: D

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46. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is

A. $-1.5D$

B. $-6.5D$

C. $+6.5D$

D. $+6.67D$

Answer: A

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47. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is

A. $+1.5$

B. -1.5

C. $+6.67$

D. -6.67

Answer: B

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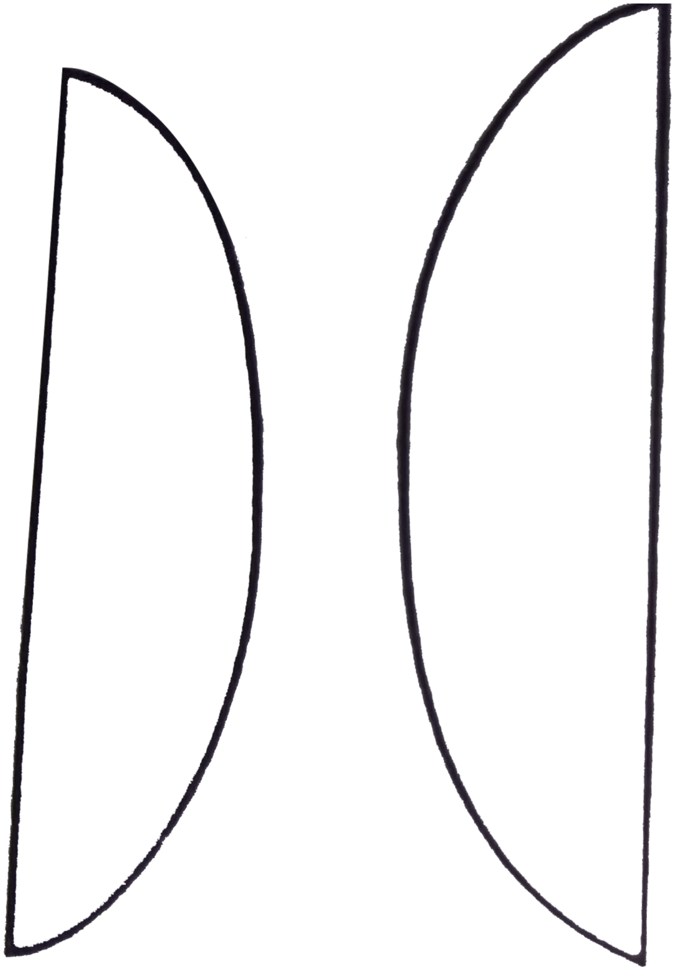
48. If the space between the lenses in the lens combination shown were filled with water, what should happen to the focal length and power of the lens combination ?



A. Focal length $=$ Decreased, Power $=$ increased

B. Focal length $=$ Decreased, Power $=$ unchanged

C. Focal length $=$ Increased, Power $=$ unchnaged

D. Focal length $=$ Increased, Power $=$ decreased

Answer: D

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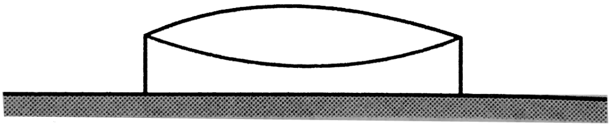
49. A convex lens is placed in contact with a mirror as shown. If he space between them is filed with water, its power will



A. decreases

B. increases

C. remain unchanged

D. increases or decreases depending of the focal length

Answer: A

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50. A convex lens if in contact with concave lens. The magnitude of the ratio of their focal length is $\frac{2}{3}$. Their equivalent focal length is 30 cm. What are their individual focal lengths?

A. $-75, 50$

B. $-10, 15$

C. $75, 50$

D. $-15, 10$

Answer: D

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51. A thin glass (refractive index 1.5) lens has optical power of $-5D$ in air. Its optical power in a liquid medium with refractive index 1.6 will be

A. $25D$

B. $-25D$

C. $1D$

D. None of these

Answer: D

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52. The plane faces of two identical planoconvex lenses each having focal length of $40cm$ are pressed against each other to form a usual convex lens. The distance from this lens, at which an object must be placed to obtain a real, inverted image with magnification one is

A. $80cm$

B. $40cm$

C. $20cm$

D. $162cm$

Answer: B

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53. If two lenses of $+5$ dioptres are mounted at some distance apart, the equivalent power will always be negative if the distance is

A. Greater than $40cm$

B. Equal to $40cm$

C. Equal to $10cm$

D. Less than $10cm$

Answer: A

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54. Consider an equiconvex lens of radius of curvature R and focal length f. If $f > R$, the refractive index μ of the material of the lens

A. is greater than zero but less than 1.5

B. is greater thean 1.5 but less than 2.0

C. is greater than one but less than 1.5

D. none of these

Answer: C

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55. A car is fitted with a convex side-view mirror of focal length 20 cm. A second car 2.8m behind the first car is overtaking the first car at a relative speed of 15 $\frac{m}{s}$. The speed of the image of the second car as seen in the mrror of the first one is:

A. $19.35 cm$

B. $17.45 cm$

C. $21.48 cm$

D. $15.49 cm$

Answer: A

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56. A car is fitted with a convex side-view mirror of focal length 20 cm. A second car 2.8m behind the first car is overtaking the first car at a relative speed of 15 $\frac{m}{s}$. The speed of the image of the second car as seen in the mrror of the first one is:

A. $5.79cm, 6.9cm$

B. $6.45cm, 5.16cm$

C. $2.7cm, 4.8cm$

D. $0.1m, 0.3m$

Answer: B

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57. A car is fitted with a convex side-view mirror of focal length 20 cm. A second car 2.8m behind the first car is overtaking the first car at a relative speed of 15 $\frac{m}{s}$. The speed of the image of the second car as seen in the mrror of the first one is:

A. $-1ms^{-1}$

B. $0.5ms^{-1}$

C. $0.3ms^{-1}$

D. $-0.032ms^{-1}$

Answer: D

Watch Video Solution

58. A convex lens of focal length f produces a virtual image n times the size of the object. Then the distance of the object from the lens is

A. $(n-1)f$

B. $(n+1)f$

C. $\left(\frac{n-1}{n}\right)f$

D. $\left(\frac{n+1}{n}\right)f$

Answer: C

Watch Video Solution

59. An object is placed $30cm$ to the left of a diverging lens whose focal length is of magnitude $20cm$. Which one of the following correctly states the nature and position of the virtual image formed ?

A. Nature of image $=$ inverted, enlarged , distance form lens $= 60cm$ to the right

B. Nature of image $=$ erect , diminished , distance form lens $= 12cm$ to the left

C. Nature of image $=$ inverted, enlarged,

distance form lens $= 60cm$ to the left

D. Nature of image $=$ erect, diminished,

distance form lens $= 12cm$ to the right

Answer: B

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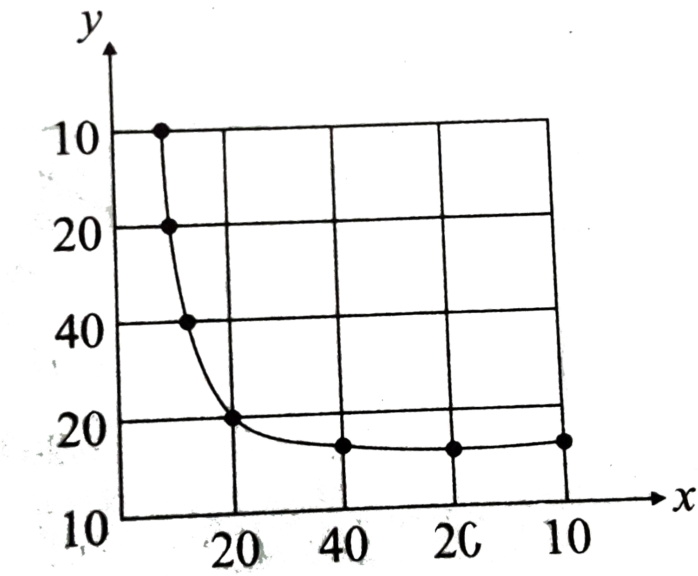
60. A lens forms a real image of an object. The distance from the object to the lens is x cm and that from the lens to the image is y cm.

The graph shows the variation of y with x.

It can be deduced that the lens is



A. converging and of focal length $10cm.$

B. converging and of focal length $20cm.$

C. converging and of focal length $40cm$

D. diverging and of focal length $20cm$

Answer: A

Watch Video Solution

61. Two identical glass $(\mu_g = 3/2)$ equiconvex lenses of focal length f are kept in contact. The space between the two lenses is filled with water $(\mu_w = 4/3)$. The focal length of the combination is

A. f

B. $\frac{f}{2}$

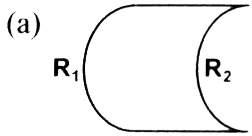
C. $\frac{4f}{3}$

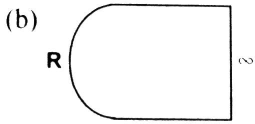
D. $\frac{3f}{4}$

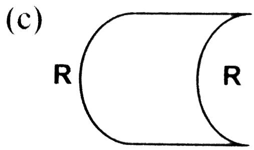
Answer: D

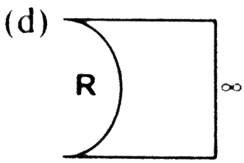
Watch Video Solution

62. Which one of the following spherical lenses does not exhibit dispersion? The radii of curvature of the surfaces of the lenses are as given in the diagrams. `

A. 

B. 

C. 

D. 

Answer: C

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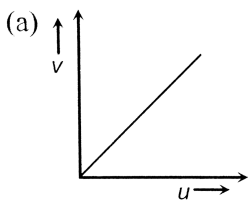
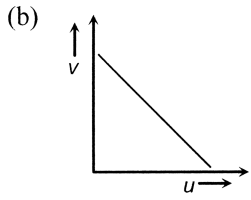
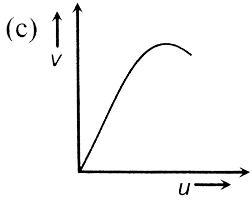
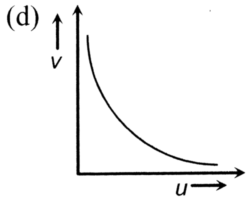
63. A student measures the focal length of a convex lens by putting an object pin at a distance u from the lens and measuring the distance v of the image pin. The graph between u and v plotted by the student should look like

A. 

B. 

C. 

D. 

Answer: D

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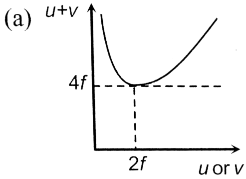
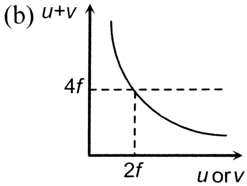
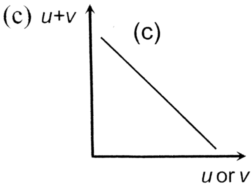
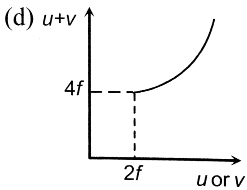
64. For a convex lens, if real image is formed the graph between $(u+v)$ and u or v is as follows

A. 

B. 

C. 

D. 

Answer: A

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Prism Theory And Dispersion Of Light

1. The critical angle between and equilateral prism and air is 45°. If the incident ray is perpendicular to the refracting surface, then

A. After deviation it will emerge from the second refracting surface

B. It is totally reflected on the second surface and emerges out perpendicularly from third surface in air

C. It is totally reflected from the second and third refracting surfaces and finally emerges out from the first surface.

D. It is totally reflected from all the three sides of prism and never emerges out

Answer: B

Watch Video Solution

2. The refracting angle of a glass prism is 30°. A ray is incident onto one of the faces perpendicular to it. Find the angle δ between the incident ray and the ray that leaves the prism. The refractive index of glass is $\mu = 1.5$.

A. $18^\circ 36'$

B. $20^\circ 30^{\circ'}$

C. 18°

D. $22^\circ 1'$

Answer: A

Watch Video Solution

3. When light rays are incident on a prism at an angle of 45°, the minimum deviation is obtained. If refractive index of the material of prism is $\sqrt{2}$, then the angle of prism will be

A. 30°

B. 40°

C. 50°

D. 60°

Answer: D

Watch Video Solution

4. A light ray is incident by grazing one of the face of a prism and after refraction ray does not emerge out, what should be the angle of prism while critical angle is C ?

A. Equal to $2C$

B. Less than $2C$

C. More than $2C$

D. None of the above

Answer: C

Watch Video Solution

5. A parallel beam of monochromatic light is incident at one surface of a equilateral prism. Angle of incidence is 55° and angle of emergence is 46°. The angle of minimum deviation will be

A. Less than 41°

B. Equal to 41°

C. More than 41°

D. None of the above

Answer: A

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6. Three prisms of crown glass, each have angle of prism 9° and two prisms of flint glass are used to make direct vision spectroscope.

What will be the angle of flint glass prisms if μ for flint is 1.69 and μ for crown glass is 1.53 ?

A. 11.9°

B. 16.0°

C. 15.3°

D. 9.11°

Answer: A

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7. If the refractive indices of crown glass for red, yellow and violet colours are 1.5140, 1.5170 and 1.5318 respectively and for flint glass these are 1.6434, 1.6499 and 1.6852 respectively, then the dispersive powers for crown and flint glass are respectively.

A. 0.034 and 0.064

B. 0.064 and 0.034

C. 1.00 and 0.064

D. 0.034 and 1.0

Answer: A

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8. Flint glass prism is joined by a crown glass prism to produce dispersion without deviation. The refractive indices of these for mean rays are 1.602 and 1.500 respectively. Angle of prism of flint prism is 10°, then the angle of prism for crown prism will be

A. $12^{\circ} 2.4'$

B. $12^{\circ}4'$

C. 1.24°

D. 12°

Answer: A

Watch Video Solution

9. A beam of white light passing through a hollow prism give no spectrum.

A. There is no dispersion and no deviation

B. Dispersion but no deviation

C. Deviation but no dispersion

D. There is dipsersion and deviation both

Answer: A

Watch Video Solution

10. The light ray is incidence at angle of 60° on a prism of angle 45°. When the light ray falls on the other surface at 90°, the refractive index of the material of prismμ and the angle of devation δ are given by

A. $\mu = \sqrt{2}, \delta = 30^\circ$

B. $\mu = 1.5, \delta = 15^\circ$

C. $\mu = \frac{\sqrt{3}}{2}, \delta = 30^\circ$

D. $\mu = \frac{\sqrt{3}}{2}, \delta = 15^\circ$

Answer: D

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11. The angle of minimum deviation measured with a prism is 30° and the angle of prism is 60°. The refractive index of prism material is

A. $\sqrt{2}$

B. 2

C. $3/2$

D. $4/3$

Answer: A

Watch Video Solution

12. If the refractive indices of a prism for red, yellow and violet colours be $1.61, 1.63$ and 1.65 respectively, then the dispersive power of the prism will be

A. $\frac{1.65 - 1.62}{1.61 - 1}$

B. $\frac{1.62 - 1.61}{1.65 - 1}$

C. $\frac{1.65 - 1.61}{1.63 - 1}$

D. $\frac{1.65 - 1.63}{1.61 - 1}$

Answer: C

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13. The minimum deviation produced by a hollow prism filled with a certain liquid is found to be 30°. The light ray is also found to be refracted at angle of 30°. The refractive index of the liquid is

A. $\sqrt{2}$

B. $\sqrt{3}$

C. $\sqrt{\frac{3}{2}}$

D. $\frac{3}{2}$

Answer: A

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14. A thin prism P_1 with angle $4 degree$ and made from glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation. The angle of the prism P_2 is

A. 2.6°

B. 3°

C. 4°

D. 5.33°

Answer: B

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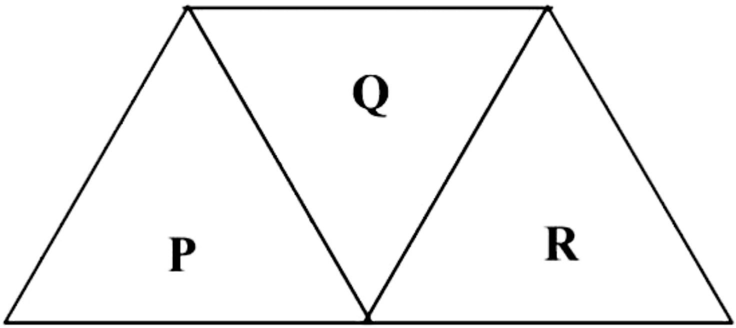
15. A given ray of light suffers minimum deviation in an equilateral prism P. Additional prism Q and R of identical shape and of the same material as P are now added as shown in the figure. The ray will now suffer



A. Greater deviation

B. Same deviation

C. No deviation

D. Total internal reflection

Answer: B

Watch Video Solution

16. Angle of a prism is 30° and its refractive index is $\sqrt{2}$ and one of the surface is silvered. At what angle of incidence, a ray should be incident on one surface so that after reflection from the silvered surface, it retraces its path ?

A. 30°

B. 60°

C. 45°

D. $\sin^{-1}\sqrt{1.5}$

Answer: C

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17. A ray of light is incident at an angle of 60° on the face of a prism having refracting angle 30°. The ray emerging out of the prism makes an angle 30° with the incident ray. Show that the emergent ray is perpendicular to the face through which it emerges.

A. Normal to the face through which it emerges

B. Inclined at 30° to the face through which it emerges

C. Inclined at 60° to the face through which it emerges

D. None of these

Answer: A

Watch Video Solution

18. A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence and each of these angles is equal to $3/4$ of the angle of the prism. The angle of deviation is

A. 45°

B. 39°

C. 20°

D. 30°

Answer: D

Watch Video Solution

19. One face of a prism with a refrective angle of 30° is coated with silver. A ray of light incident on another face at an angle of 45° is refracted and reflected from the silver coated face and retraces its path. What is the refractive index of the prism?

A. 1.5

B. $\frac{3}{\sqrt{2}}$

C. $\sqrt{2}$

D. $\frac{4}{3}$

Answer: C

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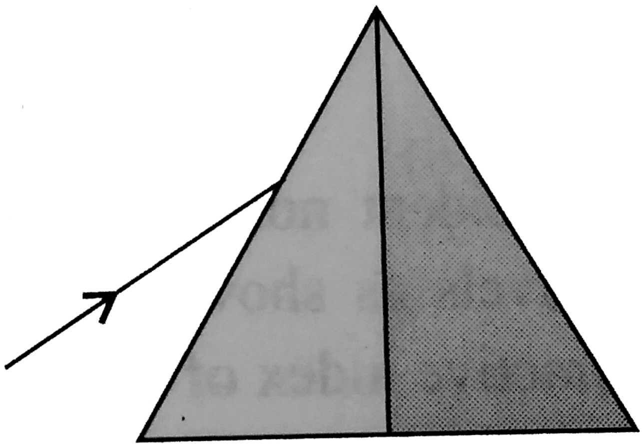
20. A light ray is incident upon a prism in minimum deviation position and suffers a deviation of 34°. If the shaded half of the prism is knowked off, the ray will



A. Suffer a deviation of 34°

B. Suffer a deviation of 68°

C. Suffer a deviation of 17°

D. Not come out of the prism

Answer: C

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21. A ray of monochromatic light is incident on one refracting face of a prism of angle 75°. It passes through the prism and is incident on the other face at the critical angle. If the refractive index of the material of the prism is $\sqrt{2}$, the angle of incidence on the first face of the prism is

A. 30°

B. 45°

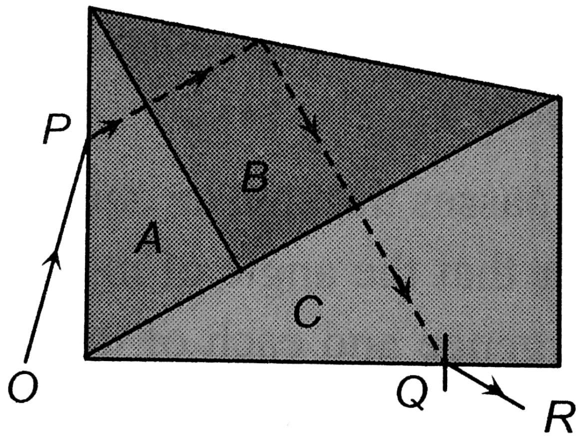
C. 60°

D. 0°

Answer: B

Watch Video Solution

22. Three glass prism A, B and C of same refractive index are placed in contact with each other as shown in figure, with no air gap between the prisms. Monochromatic ray of light OP passes through the prism assembly and emerges as QR. The conditions of minimum deviation is satisfied in the prisms.



A. A and C

B. B and C

C. A and B

D. In all prisms A, B and C

Answer: C

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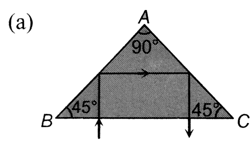
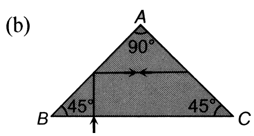
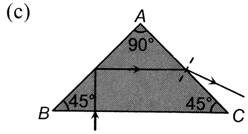
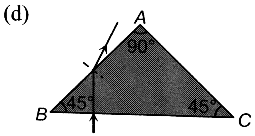
23. The refractive index of a material of a prism of angles $45^\circ - 45^\circ - 90^\circ$ is 1.5. The path of the ray of light incident normally on the hypotenuse side is shown in

A. 

B. 

C. 

D. 

Answer: A

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24. Angle of prism is A and its one surface is silvered. Light rays falling at an angle of incidence $2A$ on first surface return back through the same path after suffering reflection at second silvered surface.

Refraction index of the material of prism is

A. $2 \sin A$

B. $2 \cos A$

C. $\frac{1}{2} \cos A$

D. $\tan A$

Answer: B

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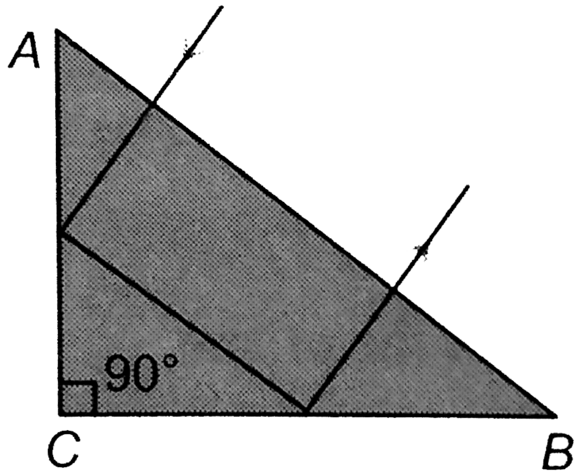
25. A ray of light incident normally on an isosceles right angled prism travels as shown in the figure. The least value of the refractive index of the prism must be



A. $\sqrt{2}$

B. $\sqrt{3}$

C. 1.5

D. 2.0

Answer: A

Watch Video Solution

26. When light of wavelength λ on an equilateral prism, kept on its minimum deviation position, it is found that the angle of deviation equals the angle the angle of the prism itself. The refractive index of the material of the prism for the wavelength λ is

A. $\sqrt{3}$

B. $\frac{\sqrt{3}}{2}$

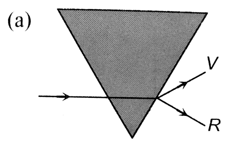
C. 2

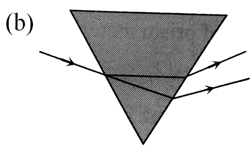
D. $\sqrt{2}$

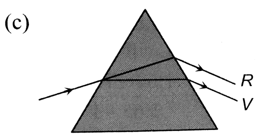
Answer: A

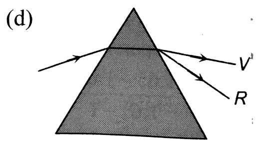
Watch Video Solution

27. Which of the following diagrams shows correctly the dispersion of white light by a prism ?

A. 

B. 

C. 

D. 

Answer: B

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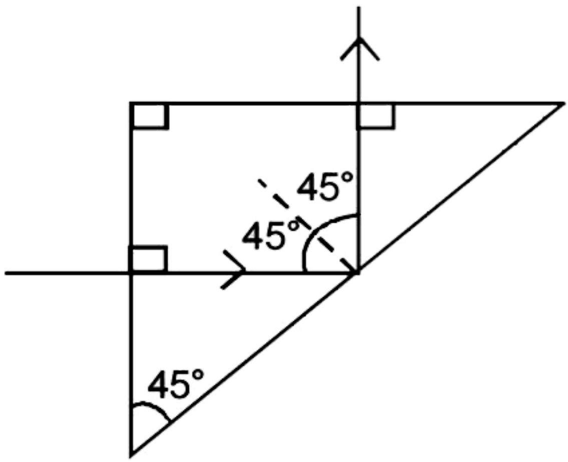
28. A light ray is incident perpendicularly to one face of a 90° prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45°, we conclude that the refractive index n



A. Less than 1.41

B. Equals to 1.41

C. Greater than 1.41

D. None of the above

Answer: C

Watch Video Solution

29. Two lenses having $f_1 : f_2 = 2 : 3$ has combination to make no dispersion. Find the ratio of dispersive power of glasses used

A. $2:3$

B. $3:2$

C. $4:9$

D. $9:4$

Answer: A

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30. If refractive index of red, violet and yellow light are 1.42, 1.62 and 1.50 respectively for a medium. Its dispersive power will be

A. 0.4

B. 0.3

C. 0.2

D. 0.1

Answer: A

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31. A ray of light is incident at small angle I on the surface of prism of small angle A and emerges normally from the oppsite surface. If the refractive index of the material of the prism is mu, the angle of incidence is nearly equal to

A. A/μ

B. $A/2\mu$

C. μA

D. $\mu A/2$

Answer: C

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32. The angle of a prism is 60° and its refractive index is $\sqrt{2}$. The angle of minimum deviation suffered by a ray of light in passing through it is

A. About 20°

B. 30°

C. 60°

D. 45°

Answer: B

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33. The dispersive powers of crown and flint glasses are 0.02 and 0.04 respectively. In an achromatic combination of lenses the focal length of flint glass lens is $40cm$. The focal length of crown glass lens will be

A. $-20cm$

B. $+20cm$

C. $-10cm$

D. $+10cm$

Answer: A

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34. When a ray of light is incident normally on one refracting surface of an equilateral prism (Refractive index of the material of the prism $= 1.5$

A. Emerging ray is deviated by 30

B. Emerging ray is deviated by 45°

C. Emerging ray just grazes the second refracting surface

D. The ray undergoes total internal reflection at the second refracting surface

Answer: D

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35. Under minimum deviation condition in a prism, if a ray is incident at an angle 30°, the angle between the emergent ray and the second refracting surface of the prism is

A. 0°

B. 30°

C. 45°

D. 60°

Answer: D

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36. A ray of light is incident normally on one of the faces of a prism of apex angle 30 degree and refractive index $\sqrt{2}$. The angle of deviation of the ray is...degrees.

A. 26°

B. 0°

C. 23°

D. 15°

Answer: D

Watch Video Solution

37. For a prism of refractive index 1.732, the angle of minimum deviation is equal to the angle of the prism. The angle of the prism is

A. 80°

B. 70°

C. 60°

D. 50°

Answer: C

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38. When a glass prism of refracting angle 60° is immersed in a liquid its angle of minimum deviation is 30°. The critical angle of glass with respect to the liquid medium is

A. 42°

B. 45°

C. 50°

D. 52°

Answer: B

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39. A prism of refractive index p and angle A is placed in the minimum deviation position. If the angffe of minimum deviation is A, then the value of A in terms of p is

A. $\sin^{-2}\left(\frac{\mu}{2}\right)$

B. $\sin^{-1}\sqrt{\frac{\mu-1}{2}}$

C. $2\cos^{-1}\left(\frac{\mu}{2}\right)$

D. $\cos^{-1}\left(\frac{\mu}{2}\right)$

Answer: C

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40. A prism of refractive index sqrt2 has refractive angle 60°. In the order that a ray suffers minimum deviation it should be incident at an angle of

A. 45°

B. 60°

C. 90°

D. 180°

Answer: A

Watch Video Solution

41. A parallel beam of white light falls on a convex lens. Images of blue, yellow and red light are formed on other side of the lens at a distance of $0.20m, 0.205m$ and $0.214m$ respectively. The dispersive power of the material of the lens will be

A. $619/1000$

B. $9/200$

C. $14/205$

D. $5/214$

Answer: C

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42. A beam of light composed of red and green ray is incident obliquely at a point on the face of rectangular glass slab. When coming out on the opposite parallel face, the red and green ray emerge form

A. Two points propagating in two different directions

B. Two points propagating in two parallel directions

C. One point propagating in two different directions

D. One point propagating in the same directions

Answer: B

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43. A ray of monochromatic light suffers minimum deviation of 38° while passing through a prism of refracting angle 60°.

Refracting index of the prism material is

A. 1.5

B. 1.3

C. 0.8

D. 2.4

Answer: A

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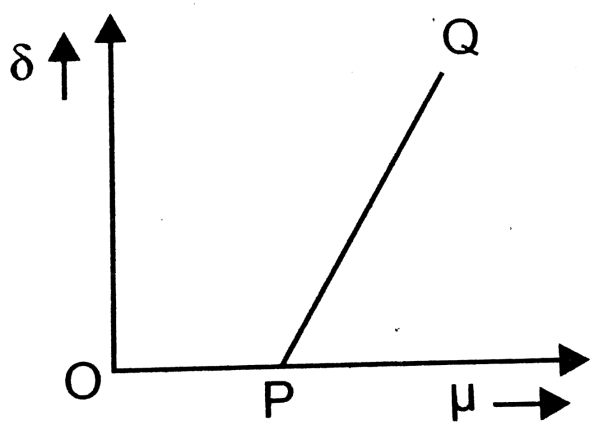
44. For a small angled prism, angle of prism A of minimum deviation(δ) varies with the refractive index of the prism as shown in the graph



A. Point P corresponds to $m = 1$

B. Slope of the line $PQ = A/2$

C. Slope $= 2A$

D. None of the above statements is true

Answer: A

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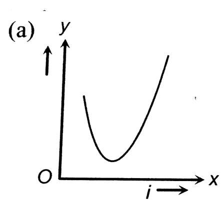
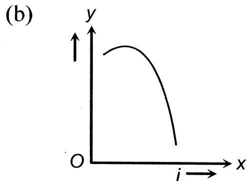
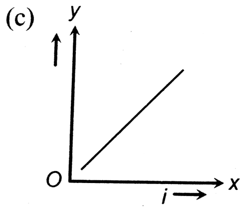
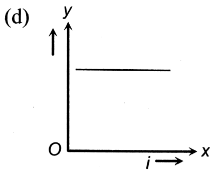
45. The graph between angle of deviation (δ) and angle of incidence (i) for a triangular prism is represented by

A. 

B. 

C. 

D. 

Answer: A

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Optical Instruments

1. A person suffering from hypermetropia requires which type of spectacle lenses ?

A. Concave lens

B. Plano-concave lens

C. Convexo – concave lens

D. Convex lens

Answer: D

Watch Video Solution

2. A man who cannot see clearly beyond $5m$ wants to see starts clearly. He should use a lens of focal length

A. $-100m$

B. $+5m$

C. $-5m$

D. Very large

Answer: C

Watch Video Solution

3. A man can see only between $75cm$ and $200cm$. The power of lens to correct the near point will be

A. $+8/3D$

B. $+3D$

C. $-3D$

D. $-8/3D$

Answer: A

Watch Video Solution

4. A man can see the objects upto a distance of one metre from his eyes. For correcting his eye sight so that he can see an object at infinity, he requires a lens whose power is

A. $+0.5D$

B. $+1.0D$

C. $+2.0D$

D. $-1.0D$

Answer: D

Watch Video Solution

5. A man can see the object between $15cm$ and $30cm$. He uses the lens to see the far objects. Then due to the lens to see the far objects. Then due to the lens used, the near point will be at

A. $\frac{10}{3}cm$

B. $30cm$

C. $15cm$

D. $\frac{100}{3}cm$

Answer: B

Watch Video Solution

6. The far point of a myopia eye is at $40cm$. For removing this defect, the power of lens required will be

A. $40D$

B. $-4D$

C. $-2.5D$

D. $0.25D$

Answer: C

Watch Video Solution

7. A man suffering from myopia can read book placed at $10cm$ distance. For reading the book at a distance of $60cm$ with relaxed vision, focal length of the lens required will be

A. $45cm$

B. $-20cm$

C. $-12cm$

D. $30cm$

Answer: C

Watch Video Solution

8. A person is suffering from myopic defect. He is able to see clear objects placed at $15cm$. What type and of what focal length of lens he should use to see clearly the object placed $60cm$ away ?

A. Concave lens of $20cm$ focal length

B. Convex lens of $20cm$ focal length

C. Concave lens of $12cm$ focal length

D. Convex lens of $12cm$ focal length

Answer: A

Watch Video Solution

9. A person can see clearly only upto a distance of $25cm$. He wants to read a book placed at a distance of $50cm$. What kind of lens does he require for his spectacles and what must be its power ?

A. Concave, $-1.0D$

B. Convex, $+1.5D$

C. Concave, $-2.0D$

D. Convex, $+2.0D$

Answer: C

Watch Video Solution

10. A person's near point is $50cm$ and his far point $3m$. answer the following question when

(i) Power of the lenses he requires for reading

and

(ii) Power of the lenses he requires for for seeing distant stars are

A. $-2D$ and $-0.33D$

B. $2D$ and $-0.33D$

C. $-2D$ and $3D$

D. $2D$ and $-3D$

Answer: B

Watch Video Solution

11. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is

A. $+1.5$

B. -1.5

C. $+6.67$

D. -6.67

Answer: B

Watch Video Solution

12. Two parallel pillars are $11km$ away from an observer. The minimum distance between the pillars so that they can be seen separately will be

A. $3.2m$

B. $20.8m$

C. $91.5m$

D. $183m$

Answer: A

Watch Video Solution

13. A person who can see things most clearly at a distance of $10cm$. Requires spectacles to enable to him to see clearly things at a distance of $30cm$. What should be the focal length of the spectacles ?

A. $15cm$(Concave)

B. $15cm$ (Convex)

C. $10cm$

D. 0

Answer: A

Watch Video Solution

14. Far points of myopic eye is $250cm$, then the focal length of the lens to be used will be

A. $-250cm$

B. $-250 / 9cm$

C. $+250cm$

D. $+250 / 9cm$

Answer: A

Watch Video Solution

15. A man can see clearly up to 3 metres. Prescribes a lens for his spectacles so that he can see clearly up to 12 metres

A. $-3/4D$

B. $3D$

C. $-1/4D$

D. $-4D$

Answer: C

Watch Video Solution

16. A satisfactory photographic print is obtained when the exposure time is $10\sec$ at a distance of $2m$ from a $60cd$ lamp. The time of exposure required for the same quality print at a distance of $4m$ from a $120cd$ lamp is

A. $5\,\mathrm{sec}$

B. $10\,\mathrm{sec}$

C. $15\,\mathrm{sec}$

D. $20\,\mathrm{sec}$

Answer: D

Watch Video Solution

17. A person uses a lens of power $+3D$ to normalise vision. Near point of hypermetropic eye is

A. $1m$

B. $1.66m$

C. $2m$

D. $0.66m$

Answer: A

Watch Video Solution

18. A student can distinctly see the object upto a distance $15cm.$ He wants to see the black board at a distance of $3m$ answer the following questions (a) Focal length of lens (b) power of lens

A. $-4.8cm, \ -3.3D$

B. $-5.8cm, \ -4.3D$

C. $-7.5cm, \ -6.3D$

D. $-15.8cm, \ -6.3D$

Answer: D

Watch Video Solution

19. The exposure time of a camera lens at the $\frac{f}{2.8}$ setting is $\frac{1}{200}$ second. The correct time of exposure at $\frac{f}{5.6}$ is

A. 0.4 sec

B. 0.02 sec

C. 0.002 sec

D. 0.04 sec

Answer: B

Watch Video Solution

20. The focal lengths of the objective and eye $-$ lens of a microscope are $1cm$ and $5cm$ respectively. If the magnifying power for the relaxed eye is 45, then the length of the tube is

A. $30cm$

B. $25cm$

C. $15cm$

D. $12cm$

Answer: C

Watch Video Solution

21. The length of the compound microscope is $14cm$. The magnifying power for relaxed eye is 25. If the focal length of eye lens is $5cm$, then the object distance for objective lens will be

A. $1.8cm$

B. $1.5cm$

C. $2.1cm$

D. $2.4cm$

Answer: A

Watch Video Solution

22. If the focal length of objective and eye lens are $1.2cm$ and $3cm$ respectively and the object is put $1.25cm$ away from the objective lens and the final image is formed at infinity. The magnifying power of the microscope is

A. 150

B. 200

C. 250

D. 400

Answer: B

Watch Video Solution

23. The focal length of objective and eye lens of a microscope are $4cm$ and $8cm$ respectively. If the least distance of distinct vision is $24cm$ and object distance is $4.5cm$ from the objective lens, then the magnifying power of the microscope will be

A. 18

B. 32

C. 64

D. 20

Answer: B

Watch Video Solution

24. The magnifying power of a microscope with an objective of $5mm$ focal length is 400. The length of its tube is $20cm$. Then the focal length of the eye $-$ piece is

A. $200cm$

B. $160cm$

C. $2.5cm$

D. $0.1cm$

Answer: C

Watch Video Solution

25. If the focal length of the objective lens is increased then

A. Magnifying power of the microscope will increase but that of telescope will decrease

B. Magnifying power of microscope and telescope both will increase

C. Magnifying power of microscope and telescope both will decrease

D. Magnifying power of microscope will decrease but that of telescope will increase

Answer: D

Watch Video Solution

26. The focal length of the objective and the eye piece of a compound microscope are 2.0 cm and 3.0 cm, respectively. The distance between the objective and the eye piece is 15.0 cm. The final image formed by the eye piece is at infinity. The two lenses are thin. The distance in cm of the object and the image produced by the objective, measured from the objective lens, are respectively

A. 2.4 and 12.0

B. 2.4 and 15.0

C. $2.3$and 12.0

D. 2.3 and 3.0

Answer: A

Watch Video Solution

27. The objective lens of a compound microscope produces magnification of 10. In order to get an overall magnification of 100 when image is formed at $25cm$ from the eye, the focal length of the eye lens should be

A. $4cm$

B. $10cm$

C. $\frac{25}{9}cm$

D. $9cm$

Answer: C

Watch Video Solution

28. In a compound microscope, the focal lengths of two lenses are $1.5cm$ and $6.25cm$ an object is placed at $2cm$ form objective and the final image is formed at $25 cm$ from eye lens. The distance between the two lenses is

A. $6.00 cm$

B. $7.75 cm$

C. $9.25 cm$

D. $11.00 cm$

Answer: D

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29. A simple telescope, consisting of an objective of focal length $60cm$ and a single eye lens of focal length $5cm$ is focused on a distant object is such a way that parallel rays comes out from the eye lens. If the object subtends an angle 2° at the objective, the angular width of the image.

A. 10°

B. 24°

C. 50°

D. $1/6^{\circ}$

Answer: B

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30. The diameter of the objective of the telescope is 0.1 metre and wavelength of light is 6000Å. Its resolving power would be approximately

A. $7.32 \times 10^{-6} rad$

B. $1.36 \times 10^6 rad$

C. $7.32 \times 10^{-5} rad$

D. $1.36 \times 10^5 rad$

Answer: D

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31. The focal length of objective and eye lens of a astronomical telescope are respectively $2m$ and $5cm$. Final image is formed at (i)

least distance of distinct vision (ii) infinity.

The magnifying power in both cases will be

A. $-48, \ -40$

B. $-40, \ -48$

C. $-40, 48$

D. $-48, 40$

Answer: A

Watch Video Solution

32. An astronomical telescope has an angular magnification of magnitude 5 for distant object. The separation between the objective and the eyepiece is 36 cm and the final image is formed at infinity. The focal length f_0 of the objective and the focal length f_0 of the eyepiece are

A. $f_o = 45cm$ and $f_e = -9cm$

B. $f_o = 7.2cm$ and $f_e = 5cm$

C. $f_o = 50cm$ and $f_e = 10cm$

D. $f_o = 30cm$ and $f_e = 6cm$

Answer: D

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33. In Galilean telescope, if the powers of an objective and eye lens are respectively $+1.25D$ and $-20D$, then for relaxed vision, the length and magnification will be

A. $21.25cm$ and 16

B. $75cm$ and 20

C. $75cm$ and 16

D. $8.5cm$ and 21.25

Answer: C

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34. The magnifying power of an astronomical telescope is 8 and the distance between the two lenses is $54cm$. The focal length of eye lens and objective lens will be respectively

A. $6cm$ and $48cm$

B. $48cm$ and $6cm$

C. $8cm$ and $64cm$

D. $64cm$ and $8cm$

Answer: A

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35. An opera glass (Galilean telescope) measures $9cm$ from the objective to the eyepiece. The focal length of the objective is $15cm$. Its magnifying power is

A. 2.5

B. $2/5$

C. $5/3$

D. 0.4

Answer: A

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36. When a telescope is adjusted for parallel light, the distance of the objective from the eye piece is found to be $80cm$. The magnifying power of the telescope is 19 . The focal length of the lenses are

A. $61cm, 19cm$

B. $40cm, 40cm$

C. $76cm, 4cm$

D. $50cm, 30cm$

Answer: C

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37. Two convex lenses of focal lengths $0.3m$ and $0.05m$ are used to make a telescope. The distance kept between the two is

A. $0.35m$

B. $0.25m$

C. $0.175m$

D. $0.15m$

Answer: A

Watch Video Solution

38. The diameter of the objective lens of a telescope is $5.0m$ and wavelength of light is 6000Å. The limit of resolution of this telescope will be

A. $0.03 \sec$

B. $3.03 \sec$

C. $0.06 \sec$

D. $0.15 \sec$

Answer: A

Watch Video Solution

39. A Galilean telescope has objective and eye $-$ piece of focal lengths $200cm$ and $2cm$ respectively. The magnifying power of the telescope for normal vision is

A. 90

B. 100

C. 108

D. 198

Answer: B

Watch Video Solution

40. An astronomical telescope of ten-fold angular magnification has a length of $44cm$. The focal length of the objective is

A. $4cm$

B. $40cm$

C. $44cm$

D. $440cm$

Answer: B

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41. The focal lengths of the lenses of an astronomical telescope are $50cm$ and $5cm$. The length of the telescope when the image is formed at the least distance of distinct vision is

A. $45cm$

B. $55cm$

C. $\frac{275}{6}cm$

D. $\frac{325}{6}cm$

Answer: D

Watch Video Solution

42. Sun's diameter is $1.4 \times 10^9 m$ and its distance from the earth is $10^{11} m$. The diameter of its image, formed by a convex lens of focal length $2m$ will be

A. $0.7cm$

B. $1.4cm$

C. $2.8cm$

D. Zero$(i. e. ,$ point image)

Answer: C

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43. In a terrestrial telescope, the focal length of objective is $90cm$, of inverting lens is $5cm$ and of eye lens is $6cm$. If the final image is at $30cm$, then the magnification will be the final image is at $30cm$, then the magnification will be

A. 21

B. 12

C. 18

D. 15

Answer: C

Watch Video Solution

44. A telescope has an objective of focal length $50cm$ and an eyepiece of focal length $5cm$. The least distance of distinct vision is $25cm$. The telescope is focused for distinct vision on a scale $2m$ away from the objective. Calculate (a) magnification produced and (b) separation between objective and eyepiece.

A. $75cm$

B. $60cm$

C. $71cm$

D. $74cm$

Answer: C

Watch Video Solution

45. A telescope of diameter $2m$ uses light of wavelength $5000Å$ for viewing stars.The minimum angular separation between two stars whose is image just resolved by this telescope is

A. $4 \times 10^{-4} rad$

B. $0.25 \times 10^{-6} rad$

C. $0.31 \times 10^{-6} rad$

D. $5.0 \times 10^{-3} rad$

Answer: C

Watch Video Solution

46. A simple magnifying lens is used in such a way that an image is formed at $25cm$ away from the eye. In order to have 10 times magnification, the focal length of the lens should be

A. $5cm$

B. $2cm$

C. $25mm$

D. $0.1mm$

Answer: C

Watch Video Solution

47. In a simple microscope, if the final image is located at infinity then its magnifying power is

A. $\frac{25}{f}$

B. $\frac{D}{26}$

C. $\frac{f}{25}$

D. $\frac{f}{D+1}$

Answer: A

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48. In a compound microscope the objective of f_o and eyepiece of f_e are placed at distance L such that L equals

A. $f_o + f_e$

B. $f_o - f_e$

C. Much greater than f_o or f_e

D. Need not depend either value of focal lengths

Answer: C

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49. For a compound microscope, the focal length of object lens and eye lens are f_o and f_e respectively, then magnification will be done by microscope when

A. $f_o = f_e$

B. $f_o > f_e$

C. $f_o < f_e$

D. None of these

Answer: C

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50. The angular resolution of a $10 cm$ diameter telescope at a wavelength 5000Å is of the order

A. $10^6 rad$

B. $10^{-2} rad$

C. 10^{-4} rad

D. 10^{-6} rad

Answer: D

Watch Video Solution

51. The diameter of objective of a telescope is $1m$. Its resolving limit for the light of wave length 4538Å, will be

A. $5.54 \times 10^{-7} rad$

B. $2.54 \times 10^{-4} rad$

C. $6.54 \times 10^{-7} rad$

D. None of these

Answer: A

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52. A telescope has an objective lens of focal length $200 cm$ and an eye piece with focal length $2 cm$. If this telescope is used to see a 50 meter tall building at a distance of $2 km$, what is the height of the image of the building formed by the objective lens?

A. $5cm$

B. $10cm$

C. $1cm$

D. $2cm$

Answer: A

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53. Magnification of a compound microscope is 30. Focal length of eye $-$ piece is $5cm$ and the image is formed at a distance of distinct vision of $25cm$. The magnification of the objective lens is

A. 6

B. 5

C. 7.5

D. 10

Answer: B

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54. A Galileo telescope has an objective of focal length $100 cm$ and magnifying power 50. The distance between the two lenses in normal adjustment will be

A. $98 cm$

B. $100 cm$

C. $150 cm$

D. $200 cm$

Answer: A

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55. A compound microscope has an eye piece of focal length $10cm$ and an objective of focal length $4cm$. Calculate the magnifcation, if an object is kept at a distance of $5cm$ from the objective so that final image is formed at the least distance vision $(20cm)$

A. 12

B. 11

C. 10

D. 13

Answer: A

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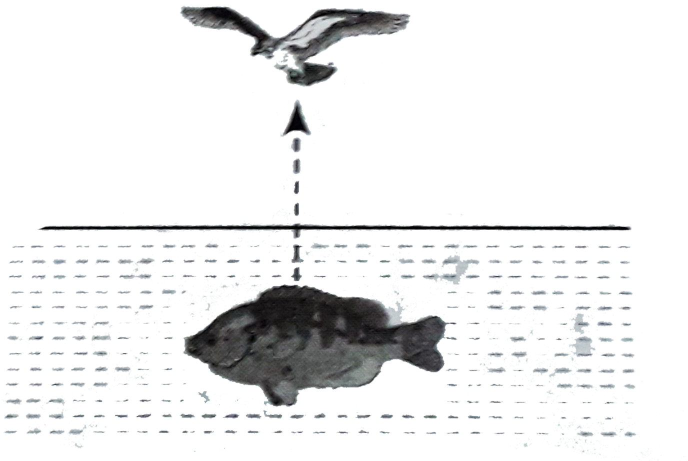
Problems Based On Mixed Concepts

1. A fish is vertically below a flying bird moving vertically down toward water surface. The bird will appear to the fish to be



A. moving faster than its speed and also away from the real distance

B. moving faster than its real speed and never than its real distance.

C. moving slower than its real speed and also nearer than its real distance

D. moving slower than its real speed and away from the real distance

Answer: A

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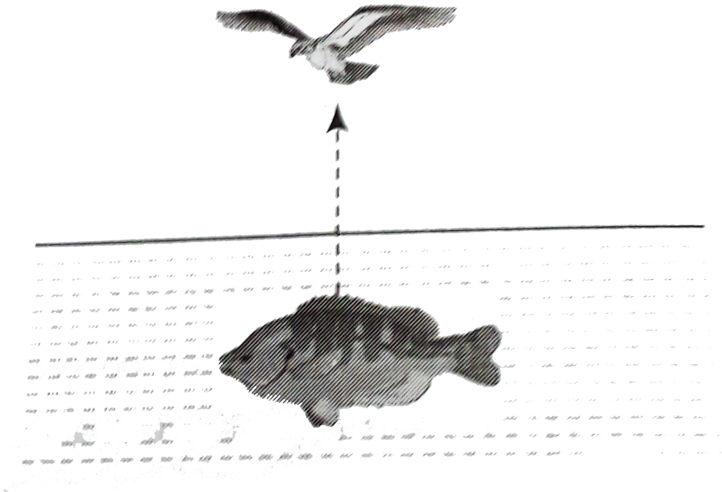
2. A fish rising up vertically toward the surface of water with speed $3ms^{-1}$ observes a bird diving down vertically towards it with speed

$9ms^{-1}$. The actual velocity of bird is



A. $4.5ms^{-1}$

B. $5.4ms^{-1}$

C. $3.0ms^{-1}$

D. $3.4ms^{-1}$

Answer: A

Watch Video Solution

3. What is the angle of incidence for an equilateral prism of refractive index $\sqrt{3}$ so that the ray si parallel to the base inside the prism?

A. 30°

B. 45°

C. 60°

D. either 30° or 60°

Answer: C

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4. A plano-convex lens when silvered on the plane side behaves like a concave mirror of focal length 60 cm. However when silvered on the convex side it behaves like a concave mirror of focal length 20 cm. Then the refractive index of the lens

A. 3.0

B. 1.5

C. 1.0

D. 2.0

Answer: B

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5. A ray of light passes from vacuum into a medium of refractive index μ. If the angle of incidence is twice the angle of refraction, then the angle of incidence is

A. $\cos^{-1}\left(\frac{\mu}{2}\right)$

B. $2\cos^{-1}\left(\frac{\mu}{2}\right)$

C. $2\sin^{-1}\left(\frac{\mu}{2}\right)$

D. $2\sin^{-1}(\mu)$

Answer: B

Watch Video Solution

6. A combination of two thin lenses with focal lengths f_1 and f_2 respectively forms and image of distant object at distance $60cm$

when lenses are in contact. The position of this image shifts by $30cm$ towards the combination when two lenses are separated by $10cm$. The corresponding values of f_1 and f_2 are

A. $30cm, \ -60cm$

B. $20cm, \ -30cm$

C. $15cm, \ -20cm$

D. $12cm, \ -15cm$

Answer: B

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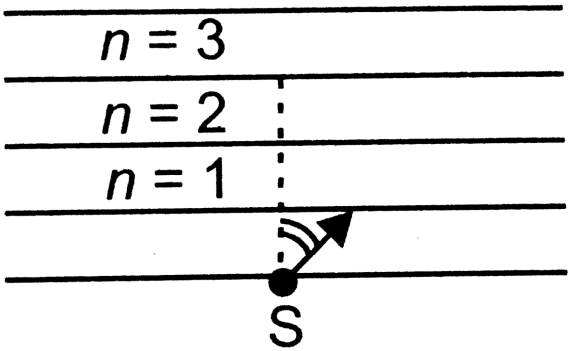
7. A point source S is placed at the bottom of different layers as shown in figure. The refractive index of bottom-most layer is μ_0. The refractive index of any other upper layer is $\mu(n) = \mu_0 - \dfrac{\mu_0}{4\pi - 18}$ where $n = 1, 2, \ldots$. A ray of light starts from the source S as shown. Total internal reflection takes place at the upper surface of the layer having n equal to



A. 3

B. 5

C. 4

D. 6

Answer: C

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8. A plane mirrorr is placed at origin parallel of $y-$ axis, facing the positive $x-$ axis. An object starts from $(2m, 0, 0)$ with a velocity of $\left(2\hat{i}+2\hat{j}\right)m/s$. The relative velocity of image with respect to object is along

A. positive $x-$ axis

B. negative $x-$ axis

C. positive y-axis

D. negative y-axis

Answer: B

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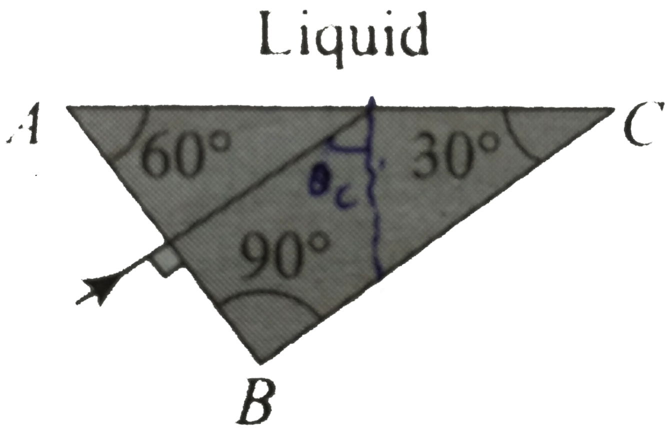
9. Light is incident normally on face AB of a prism as shown in Figure. A liquid of refractive index μ is placed on face AC of the prism. The prism is made of glass of refractive indices $3/2$. Find the limits of μ for which total internal reflection takes place on the face AC.



A. $\mu > \frac{3}{4}$

B. $\mu < \frac{3\sqrt{3}}{4}$

C. $\mu > \sqrt{3}$

D. $\mu < \frac{\sqrt{3}}{2}$

Answer: C

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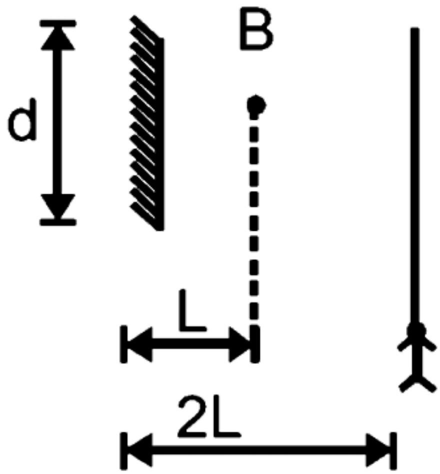
10. A point source of light B is placed at a distance L in front of the centre of a mirror of width d hung vertically on a wall. A man walks in front of the mirror along a line parallel to the mirror at a distance 2L from it as shown in fig. The greatest distance over which he can see the image of the light source in the mirror is



A. $d/2$

B. d

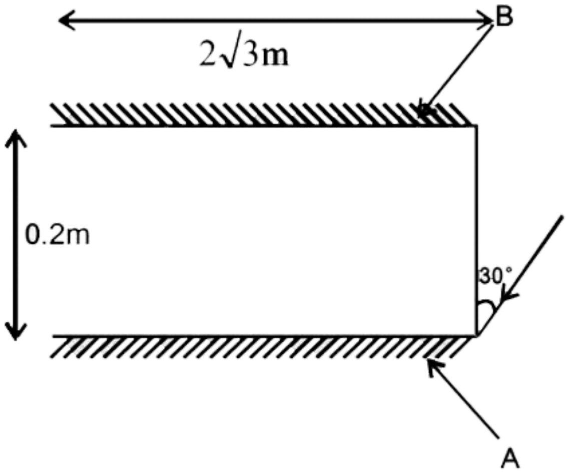
C. $2d$

D. $3d$

Answer: D

Watch Video Solution

11. Two plane mirrors A and B are aligned parallel to each other, as shown in the figure. A light ray is incident at an angle 30degree at a point just inside one end of A. The plane of incidence coincides with the plane of the figure. The maximum number of times the ray undergoes reflections (including the first one) before it emerges out is



A. 28

B. 30

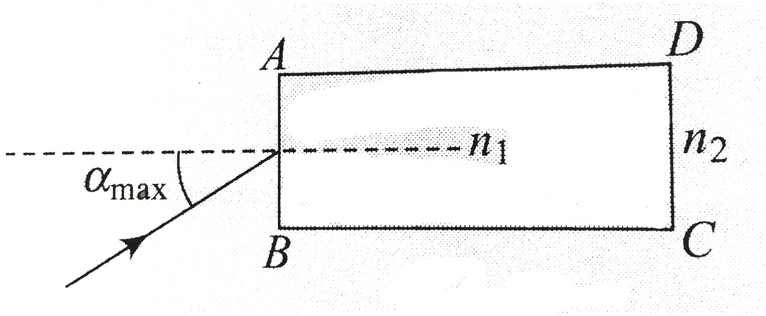
C. 32

D. 34

Answer: B

Watch Video Solution

12. A rectangular slab ABCD, of refractive index n_1 , is immersed in water of refractive index $n_2 (n_1 < n_2)$. A ray of light is incident at the surface AB of the slab as shown in Fig. Find the maximum value of angle of incidence $\alpha_{\max}$, such that the ray comes out only from the other surface CD.



A. $\sin^{-1}\left[\frac{n_1}{n_2}\cos\left(\sin^{-1}.\ \frac{n_2}{n_1}\right)\right]$

B. $\sin^{-1}\left[n_1\cos\left(\sin^{-1}.\ \frac{1}{n_2}\right)\right]$

C. $\sin^{-1}\left(\frac{n_1}{n_2}\right)$

D. $\sin^{-1}\left(\frac{n_2}{n_1}\right)$

Answer: A

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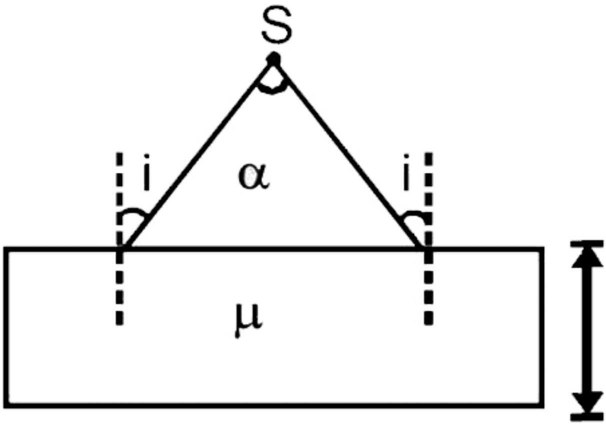
13.



A diverging beam of light from a point source S having divergence angle α, falls symmetrically on a glass slab as shown. The angles of incidence of the two extreme rays are equal. If the thickness of the glass slab is t and the refractive index n, then the divergence angle of the emergent beam is

A. Zero

B. α

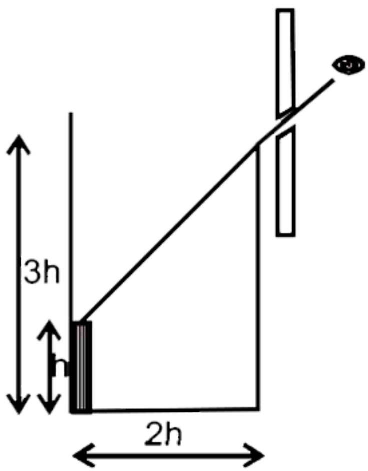
C. $\sin^{-1}(1/n)$

D. $2\sin^{-1}(1/n)$

Answer: B

Watch Video Solution

14. An observer can see through a pin-hole the top end of a thin rod of height h, placed as shown in the figure. The beaker height is 3h and its radius h. When the beaker is filled with a liquid up to a height 2h, he can see the lower end of the rod. Then the refractive index of the liquid is



A. $5/2$

B. $\sqrt{(5/2)}$

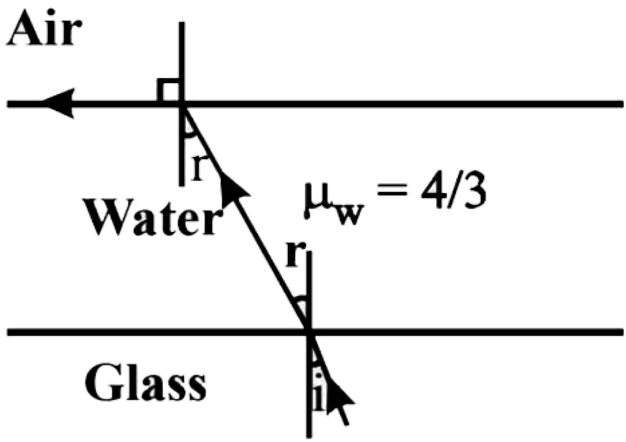
C. $\sqrt{(3/2)}$

D. $3/2$

Answer: B

Watch Video Solution

15. A ray of light is incident at the glass-water interface at an angle I, it emerges fimally parallel to the surface of water, the the value of μ_g would be



A. $(4/3)\sin i$

B. $1/\sin i$

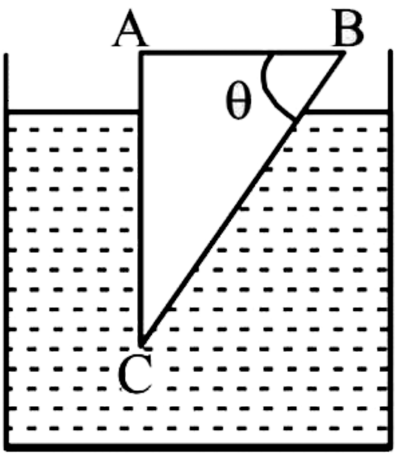
C. $4/3$

D. 1

Answer: B

Watch Video Solution

16. A glass prism of refractive index 1.5 is immersed in water (refractive index 4/3). A light beam incident normally on the face AB is totally reflected to reach on the face BC if.



A. $\sin\theta \geq 8/9$

B. $2/3 < \sin\theta < 8/9$

C. $\sin\theta \leq 2/3$

D. It is not possible

Answer: A

Watch Video Solution

17. A convex lens A of focal length 20cm and a concave lens G of focal length 5cm are kept along the same axis with the distance d between them. If a parallel beam of light falling on A leaves B as a parallel beam, then distance d in cm will be

A. 25

B. 15

C. 30

D. 50

Answer: B

Watch Video Solution

18. A hollow double concave lens is made of very thin transparent material. It can be filled with air or either of two liquids L_1 or L_2 having refractive indices n_1 and n_2, respectively $(n_2 > n_1 > 1)$. The lens will diverge parallel beam of light if it is fills with

A. Air and placed in air

B. Air and immersed in L_1

C. L_1 and immersed in L_2

D. L_2 and immersed in L_1

Answer: D

Watch Video Solution

19. The size of the image of an object, which is at infinity, as formed by a convex lens of focal length 30 cm is 2 cm. If a concave lens of focal length 20 cm is placed between the convex lens and the image at a distance of 26 cm from the convex lens, calculate the new size of the image

A. $1.25cm$

B. $2.5cm$

C. $1.05cm$

D. $2cm$

Answer: B

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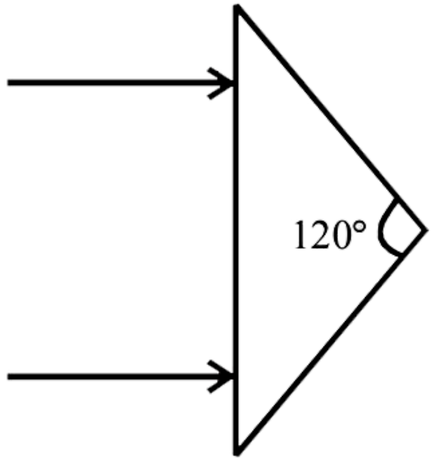
20. 

An isosceles prism of angle 120degree has a refractive index 1.44. Two parallel monochromatic rays enter the prism parallel to each other in air as shown. The rays emerge from the opposite faces

A. Are parallel to each other

B. Air diverging

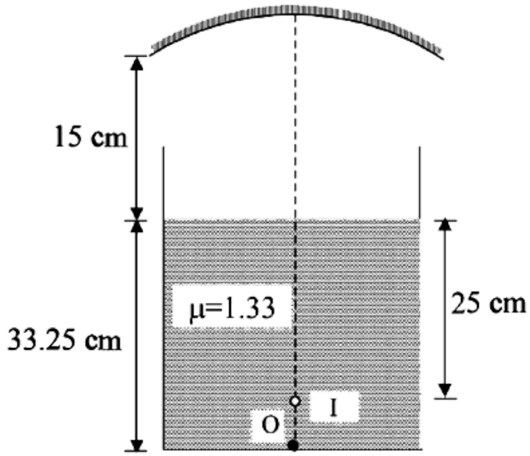
C. Make an angle $2\sin^{-1}(0.72)$ with each other

D. Make an angle $2\{\sin^{-1}(0.72) - 30^{\circ}\}$ with each other

Answer: D

Watch Video Solution

21. A container is filled with water $(\mu = 1.33)$ up to a height of 33.25 cm. A concave mirror is placed 15cm above the water level and the image of an object placed at the bottom is formed 25 cm below the water level. Focal length of the mirror is



A. 10cm

B. 15cm

C. -18.31cm

D. 20cm

Answer: C

Watch Video Solution

22. A concave mirror is placed on a horizontal table, with its axis directed vertically upwards. Let O be the pole of the mirror and C its centre of curvature. A point object is placed at C. It has a real image, also located at C. If the mirror is now filled with water, the image will be.

A. Real, and will remain at C

B. Real, and located at a point between C and ∞

C. Virtual and located at a point between C and O

D. Real, and located at a point between C and O

Answer: D

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23. A plane mirror is placed $22.5cm$ in front of a concave mirror of focal length $10cm$. Find where an object can be placed between the two mirrors, so that the first image in both the mirrors coincides.

A. $20cm$ from concave mirrorr

B. $15cm$ from the concave mirrorr

C. $5cm$ from plane mirrorr

D. $7.5cm$ from plane mirrorr

Answer: B

Watch Video Solution

24. An object is placed in front of a convex mirror at a distance of 50cm. A plane mirror is introduced covering the lower half of the convex mirror. If the distance between the object and the plane mirror is 30cm, it is found that there is no parallax between the images formed by the two mirrors. What is the radius of curvature of the convex mirror?

A. $25cm$

B. $7cm$

C. $18cm$

D. $27cm$

Answer: A

Watch Video Solution

25. A concave mirror of focal length 10cm and a convex mirror of focal length 15cm are placed facing each other 40cm apart. A point object is placed between the mirrors, on their common axis and 15cm from the concave mirror. Find the position and nature of the image produced by successive reflections, first at the concave mirror and then at the convex mirror.

A. $12cm$ behind convex mirrorr, real

B. $9cm$ behind convex mirrorr, real

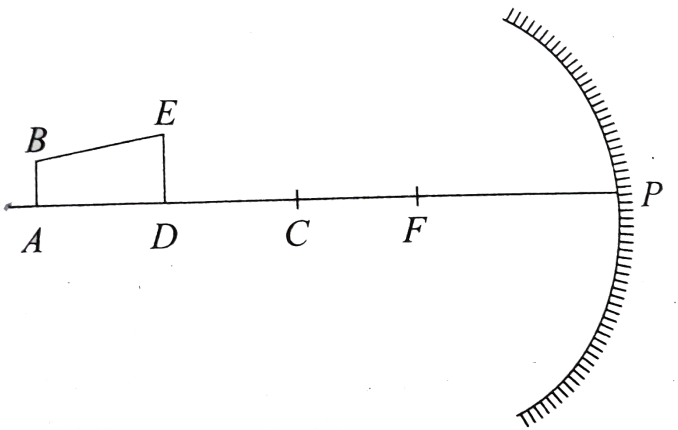
C. $6cm$ behind convex mirrorr, virtual

D. $3cm$ behind convex mirrorr, virtual

Answer: C

Watch Video Solution

26. An object ABED is placed in front of a concave mirror beyond the center of curvature C as shown in figure., State the shape of the image.



A. $|m_{AB}| < 1$ and $|m_{ED}| < 1$

B. $|m_{AB}| > 1$ and $|m_{ED}| < 1$

C. $|m_{AB}| < 1$ and $|m_{ED}| > 1$

D. $|m_{AB}| > 1$ and $|m_{ED}| > 1$

Answer: A

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27. Optic axis of a thin equi-convex lens is the x-axis. The co-ordinates of a point object and its image are

$(-40cm, 1cm)$ and $(50cm, -2cm)$,

respectively. Lens is located at

A. $x = +20cm$

B. $x = -30cm$

C. $x = -10cm$

D. origin

Answer: C

Watch Video Solution

28. An equiconvec lens of glass $(\mu_g - 1.5)$ of focal length $10 cm$ is silvered on one side. It will behave like a

A. concave mirrorr of focal length $10 cm$

B. convex mirrorr of focal length $5.0 cm$

C. concave mirrorr of focal length $2.5 cm$

D. convex mirrorr of focal length $20 cm$

Answer: C

Watch Video Solution

29. The magnification of an object placed it front of a convex lens of focal length $20cm$ is $+2$. To obtain a magnification of -2 , the object will has to be moved a distance equal to

A. $10cm$

B. $20cm$

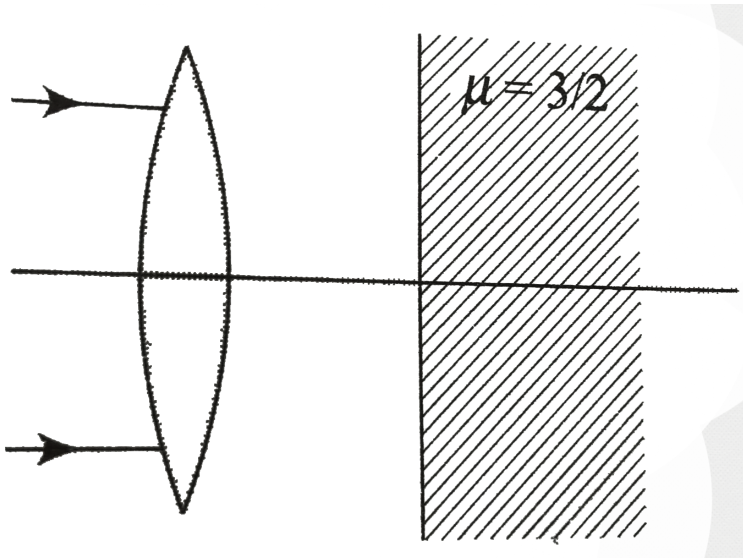
C. $30cm$

D. $40cm$

Answer: B

Watch Video Solution

30. The focal length of a thin convex-lens is 30cm. At a distance of 10 cm from the lens there is a plane refracting surface of refractive index $3/2$ Where will parallel rays incident on lens converge?



A. At a distance of $27.5cm$ from the lens

B. At a distance of $25cm$ from the lens

C. At a distance of $45cm$ from the lens

D. At a distance of $40cm$ from the lens

Answer: D

Watch Video Solution

31. Distance of an object from the first focus of an equi-convex lens is $10cm$ and the distance of its real image from second focus is $40cm$.

The focal length of the lens is

A. $25cm$

B. $10cm$

C. $20cm$

D. $40cm$

Answer: C

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32. A point object is placed on the optic axis of a convex lens of focal length f at a distance of $2f$ to the left of it. the diameter of the lens is 'd'. An eye is placed at a distance of $3f$ to the right of the lens and a distance h below the optic axis. The maximum value of h to see the image is

A. d

B. $d/2$

C. $d/3$

D. $d/4$

Answer: D

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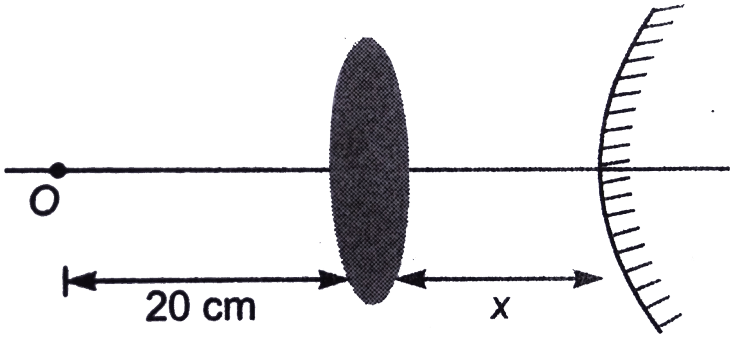
33. A point object O is placed at a distance of $20cm$ from a convex lens of focal length $10cm$ as shown in the figure. At what distance x from the lens should a convex mirror of focal length $60cm$, be placed so that final image coincide with the object?



A. $10cm$

B. $40cm$

C. $20cm$

D. final image can never coincide with the object in the given conditions.

Answer: C

Watch Video Solution

34. The distance between two point sources of light is $24cm$. Find out where would you place a converging lens of focal length $9cm$, so that the images of both the sources are formed at the same point.

A. $6cm$ from S_1

B. $15cm$ from S_1

C. $10cm$ from S_1

D. $12cm$ from S_1

Answer: A

Watch Video Solution

35. Two thin symmetrical lenses of different nature and of different material have equal radii of curvature $R = 15cm$. The lenses are put close together and immersed in water $(\mu_w = 4/3)$. The focal length of the system in water is 30cm. The difference between refractive indices of the two lenses is

A. $\frac{1}{2}$

B. $\frac{1}{4}$

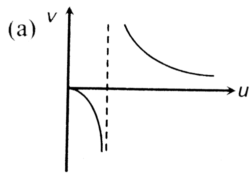
C. $\frac{1}{3}$

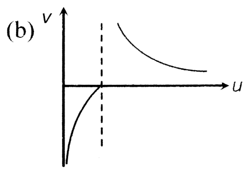
D. $\frac{3}{4}$

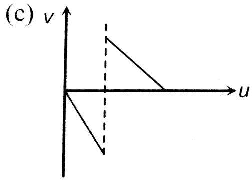
Answer: C

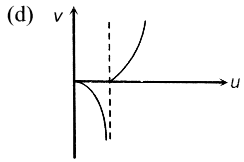
Watch Video Solution

36. As the position of an object (u) reflected from a concave mirrorr is varies, the position of the image (v) also varies. By letting the u changes from 0 to $+\infty$ the graph between v versus u will be

A. 

B. 

C. 

D. 

Answer: A

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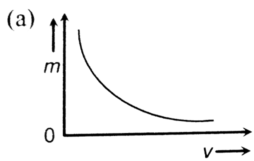
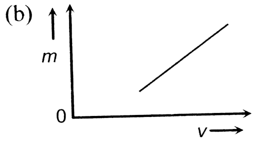
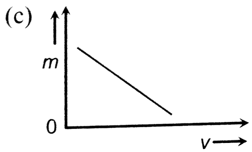
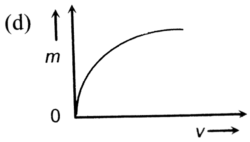
37. The graph between the lateral magnification (m) produced by a lens and the distance of the image (v) is given by

A. 

B. 

C. 

D. 

Answer: C

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Section B - Assertion Reasoning

1. Assertion : When an object is placed between two plane parallel mirrors, then all the images found are of equal intensity.

Reason : In case of plane parallel mirrors, only two images are possible.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

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2. Assertion : The size of the mirror affect the nature of the image.

Reason : Small mirrors always forms a virtual image.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

3. Assertion : Just before setting, the sun may appear to be elliptical. This happens due to refraction.

Reason : Refraction of light ray through the atmosphere may cause different magnification in mutually perpendicular directions.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

Watch Video Solution

4. Assertion : Critical angle of light passing from glass to air is minimum for violet colour.

Reason : The wavelength of blue light is greater than the light of other colour.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: C

Watch Video Solution

5. Assertion : A piece of red glass is heated till it glows in dark. The colour of glowing glass would be orange.

Reason : Red and orange is complementary colours.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

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6. Assertion : Within a glass slab, a double convex air bubble is formed. This air bubble behaves like a converging lens.

Reason: Refractive index of air is more than the refractive index of glass.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

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7. Assertion : The images formed by total internal reflections are much brighter than those formed by mirrors or lenses.

Reason : There is no loss of intensity in total internal reflection.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

Watch Video Solution

8. Assertion : The focal length of the lens does not change when red light is replaced by blue light.

Reason: The focal length of lens does not depends on colour of light used.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

Watch Video Solution

9. Assertion : There is no dispersion of light refracted through a rectangular glass slab.

Reason : Dispersion of light is the phenomenon of splitting of a beam of white light into its constituent colours.

A. If both assertion and reason are true and reason is the correct explanation of

assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: B

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10. Assertion : All the materials always have the same colour, whether viewed by reflected light or through transmitted light.

Reason : The colour of material does not depend on nature of light .

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

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11. Assertions : A beam of white light give a spectrum on passing through a hollow prism.

Reason: Speed of light outside the prism is different from the speed of light inside the prism.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

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12. Assertion : By increasing the diameter of the objective of telescope, we can increase its range.

Reason : The range of a telescope tells us how far away a star of some standard brightness can be spotted by telescope.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: B

Watch Video Solution

13. Assertion : If objective and eye lenses of a microscope are interchanged then it can work as telescope.

Reason : The objective of telescope has small focal length.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

Watch Video Solution

14. Assertion : The illuminance of an image produced by a convex lens is greater is the middle and less towards the edges.

Reason : The middle part of image is formed by undeflected rays while out part by inclined rays.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

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15. Assertion : Although the surfaces of a goggle lens are curved, it does not have any power.

Reason: In case of goggles, both the curved surfaces have equal radii of curvature.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

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16. Assertion : If the angles of the base of the prism are equal, then in the position of minimum deviation, the refracted ray will pass parallel to the base of prism.

Reason : In the case of minimum deviation, the angle of incidence is equal to the angle of emergence.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

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17. Assertion : Dispersion of light occurs because velocity of light in a material depends upon its colour.

Reason : The dispersive power depends only upon the material of the prism, not upon the refracting angle of the prism

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: B

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18. Assertion : An empty test tube dipped into water in a beaker appears silver, when viewed from a suitable direction.

Reason : Due to refraction of light, the substance in water appears silvery.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: C

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19. Assertion : Spherical aberration occur in lenses of larger aperture.

Reason : The two rays, paraxial and marginal rays focus at different points.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: A

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AIPMT/NEET Questions

1. Ray optics is valid when characteristic dimensions are

A. Of the same order as the wavelength of light

B. Much smaller than the wavelength of light

C. Of the order of one millimetre

D. Much larger then the wavelength of light

Answer: D

Watch Video Solution

2. For a prism of refractive index 1.732, the angle of minimum deviation is equal to the angle of the prism. The angle of the prism is

A. 80°

B. 70°

C. 60°

D. 50°

Answer: C

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3. Four lenses of focal length $+15cm, \ +20cm, \ +150cm$ and $+250cm$ are available for making an astronomical telescope. To produce the largest magnification, the focal length of the eye-piece should be

A. $+15cm$

B. $+20cm$

C. $+150cm$

D. $+250cm$

Answer: A

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4. Total flux produced by a source of $1cd$ is

A. $\frac{1}{4\pi}$

B. 8π

C. 4π

D. $\frac{1}{8\pi}$

Answer: C

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5. Light wave enters from medium 1 to medium 2. Its velocity in 2^{nd} medium is double from 1^{st}. For total internal reflection the angle of incidence must be greater than

A. 30°

B. 60°

C. 45°

D. 90°

Answer: A

Watch Video Solution

6. An object is at a distance of $0.5m$ in front of a plane mirrorr. Distance between the object and image is

A. $0.5m$

B. $1m$

C. $0.25m$

D. $1.5m$

Answer: B

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7. If the speed of light in vacuum is $C\ m/\sec$, then the velocity of light in a medium of refractive index 1.5 is.

A. $1.5 \times C$

B. C

C. $\frac{C}{15}$

D. Can have any velocity

Answer: C

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8. A person uses a lens of power $+3D$ to normalise vision. Near point of hypermetropic eye is

A. $1m$

B. $1.66m$

C. $2m$

D. $0.66m$

Answer: A

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9. A small air bubble in a sphere of glass with radius 4 cm appears to be 1 cm from the surface when observed along a diameter. Find the true position of the air bubble.

A. $1.2cm$

B. $3.2cm$

C. $2.8cm$

D. $1.6cm$

Answer: A

Watch Video Solution

10. A convex lens is dipped in a liquid whose refractive index is equal to the refractive of the lens. Then its focal length will

A. Become infinite

B. Become small, but non-zero

C. Remain unchanged

D. Become zero

Answer: A

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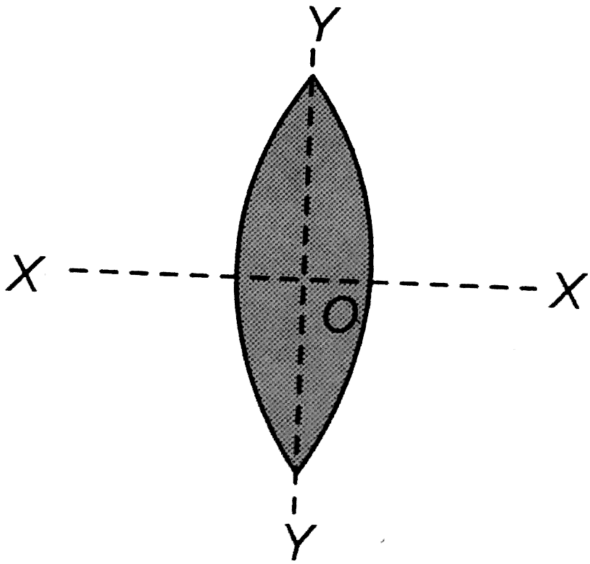
11. An equiconvex lens is cut into two halves along $(i)XOX'$ and $(ii)YOY'$ as shown in the figure. Let $f, f' f''$ be the focal lengths of the complete lens, of each half in case (i), and of each half in case (ii), respectively

Choose the correct statement from the following



A. $f' = 2f, f'' = f$

B. $f' = f, f'' = f$

C. $f' = 2f, f'' = 2f$

D. $f' = f, f'' = 2f$

Answer: D

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12. The sun makes 0.5° angle on earth surface. Its image is made by convex lens of $50cm$ focal length. The diameter of the image will be

A. $5mm$

B. $4.36mm$

C. $7mm$

D. None of these

Answer: B

Watch Video Solution

13. The chromatic aberration in lenses is due to

A. Dissimilarity of main axis of rays

B. Dissimilarity of radii of curvature

C. Variation of focal length of lenses with wavelength

D. None of these

Answer: C

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14. A glass prism has refractive index $\sqrt{2}$ and refracting angle 30° . One of the refracting surface of the prism is silvered. A beam of monchromatic light will retrace it path it its angle of incidence on the unsilvered refracting surface of the prism is

A. 45°

B. 60°

C. 0°

D. 30°

Answer: A

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15. A beam of light composed of red and green ray is incident obliquely at a point on the face of rectangular glass slab. When coming out on the opposite parallel face, the red and green ray emerge form

A. two points propagating in two different non- parallel directions

B. two points propagating in two different parallel directions

C. one point propagating in two different directions

D. one point propagating in the same directions

Answer: B

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16. A telescope has an objective lens of $10cm$ diameter and is situated at a distance of one kilometre from two objects. The minimum distance between these two objects, which can be resolved by the telescope, when the mean wavelength of light is 5000Å, of the order of

A. $0.5m$

B. $5m$

C. $5mm$

D. $5cm$

Answer: C

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17. A short linear object of length b lies along the axis of a concave mirror of focal length f at a distanee u from the pole of the mirror. The size of the image is approximately equal to

A. $b\left(\frac{u-f}{f}\right)^{1/2}$

B. $b\left(\frac{u-f}{f}\right)^{2}$

C. $b\left(\frac{f}{u-f}\right)^{1/2}$

D. $b\left(\frac{f}{u-f}\right)^{2}$

Answer: D

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18. A person who can see things most clearly at a distance of $10cm$. Requires spectacles to enable to him to see clearly things at a distance of $30cm$. What should be the focal length of the spectacles ?

A. $15cm$ (Concave)

B. $15cm$ (Concave)

C. $10cm$

D. 0

Answer: A

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19. A transparent cube of $15cm$ edge contains a small air bubble. Its apparent depth when viewed through one face is $6cm$ and when viewed through the opposite face is $4cm$. Then the refractive index of the material of the cube is

A. 2.0

B. 2.5

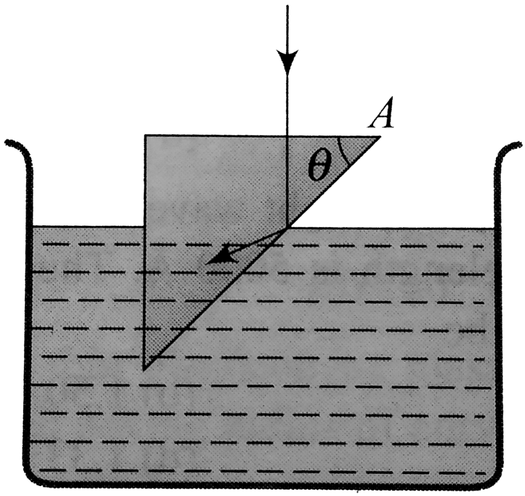
C. 1.6

D. 1.5

Answer: D

Watch Video Solution

20. The refractive indices of the material of the prism and liquid are 1.56 and 1.32 respectively. What will be the value of θ for the following refraction?



A. $\sin\theta \leq \frac{13}{11}$

B. $\sin\theta \geq \frac{11}{13}$

C. $\sin\theta \geq \frac{\sqrt{3}}{2}$

D. $\sin\theta \geq \frac{1}{\sqrt{2}}$

Answer: B

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21. The angular resolution of a $10cm$ diameter telescope at a wavelength 5000Å is of the order

A. $10^6 rad$

B. $10^{-2} rad$

C. $10^{-4} rad$

D. $10^{-6} rad$

Answer: D

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22. A fish looking up through the water sees the outside world contained in a circular horizon. If the refractive index of water is $\frac{4}{3}$ and the fish is 12 cm below the surface, the radius of this circle is cm is

A. $36\sqrt{5}$

B. $4\sqrt{5}$

C. $36\sqrt{7}$

D. $26 / \sqrt{7}$

Answer: D

Watch Video Solution

23. A concave lens and a convex lens have same focal length of $20cm$ and both put in contact this combination is used to view an object $5cm$ long kept at $20cm$ from the lens combination. As compared to object the image will be

A. Magnified and inverted

B. Reduced and erect

C. Of the same size and erect

D. Of the same size and inverted

Answer: C

Watch Video Solution

24. The focal length of field achromatic combination of a telescope is $90cm$ .The dispersive powers of lenses are 0.024 and 0.036 respectively .Their focal lengths will be-

A. $30cm$ and $60cm$

B. $30cm$ and $-45cm$

C. $45cm$ and $90cm$

D. $15cm$ and $45cm$

Answer: B

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25. A convex lens and a concave lens, each having same focal length of $25cm$, are put in contact to form a combination of lenses. The power in diopters of the combination is

A. 25

B. 50

C. infinite

D. zero

Answer: D

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26. A microscope is focused on a mark on a piece of paper and then a slab of glass of thickness $3cm$ and refractive index 1.5 is placed over the mark. How should the microscope be moved to get the mark in focus again ?

A. $1cm$ upward

B. $4.5cm$ downward

C. $1cm$ downward

D. $2cm$ upward

Answer: A

Watch Video Solution

27. The frequency of a light wave in a material is $2 \times 10^{14} Hz$ and wavelength is 5000Å. The refractive index of material will be

A. 1.40

B. 1.50

C. 3.00

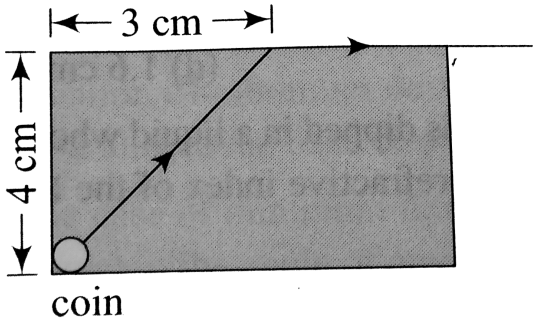
D. $1.33S$

Answer: C

Watch Video Solution

28. A small coin is resting on the bottom of a beaker filled with a liquid. A ray of light from the coin travels up to the surface of the liquid and moves along its surface (see figure).

How fast is the light travelling in the liquid ?



A. $1.8 \times 10^8 m / s$

B. $2.4 \times 10^8 m / s$

C. $3.0 \times 10^8 m / s$

D. $1.2 \times 10^8 m / s$

Answer: A

Watch Video Solution

29. Two thin lenses of focal length f_1 and f_2 are in contact and coaxial. The power of the combination is

A. $\sqrt{\frac{f_1}{f_2}}$

B. $\sqrt{\frac{f_2}{f_1}}$

C. $\frac{f_1 + f_2}{f_1 f_2}$

D. $\frac{f_1 + f_2}{f_1 f_2}$

Answer: D

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30. A boy is trying to start a fire by focusing sunlight on a piece of paper using an equiconvex lens of focal length $10cm$. The diameter of the sun is $1.39 \times 10^{9} m$ and its mean distance from the earth is $1.5 \times 10^{11} m$. What is the diameter of the sun's image on the paper ?

A. $9.2 \times 10^{-4} m$

B. $6.5 \times 10^{-4} m$

C. $6.5 \times 10^{-5} m$

D. $12.4 \times 10^{-4} m$

Answer: A

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31. A ray of light travelling in a transparant medium falls on a surface separating the medium from air at an angle of incidence of $45 degree$. The ray undergoes total internal reflection. If n is the refractive in index of the medium with respect to air, select the possible value (s) of n from the following:

A. $\mu = 1.33$

B. $\mu = 1.40$

C. $\mu = 1.50$

D. $\mu = 1.25$

Answer: C

Watch Video Solution

32. Which of the following is not due to total internal reflection ?

A. Differece between apparent and real depth of a pond

B. Mirage on hot summer days

C. Brilliance of diamond

D. Working of optical fibre

Answer: A

Watch Video Solution

33. A biconvex lens has a radius of curvature of magnitude $20cm$. Which one of the following options describes best the image formed of an object of height $2cm$ place $30cm$ from the lens ?

A. Virtual , upright, height $= 0.5cm$

B. Real, inverted, height $= 4cm$

C. Real, inverted, height $= 1cm$

D. Virtual, upright, height $= 1cm$

Answer: B

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34. A thin prism of angle 15° made of glass of refractive index $\mu_1 = 1.5$ is combined with another prism of glass of refractive index $\mu_2 = 1.75$. The combination of the prism produces dispersion without deviation. The angle of the second prism should be

A. 7°

B. 10°

C. 12°

D. 5°

Answer: B

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35. A converging beam of rays in incident on a diverging lens. Having passed through the lens the rays intersect at a point $15cm$ from the lens. If the lens is removed, the point where the rays meet, move $5cm$ closer to the mounting that holds the lens. Find the focal length of the lens.

A. $-10cm$

B. $20cm$

C. $-30cm$

D. $5cm$

Answer: C

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36. When a biconvex lens of glass having refractive index 1.47 is dipped in a liquid, it acts as a plane sheet of glass. This implies that the liquid must have refractive index.

A. less than that of glass

B. equal to that of glass

C. less than one

D. greater than that of glass

Answer: B

Watch Video Solution

37. A ray of light is incident at small angle I on the surface of prism of small angle A and emerges normally from the opposite surface. If the refractive index of the material of the prism is mu, the angle of incidence is nearly equal to

A. $\frac{A}{2\mu}$

B. μA

C. $\frac{\mu A}{2}$

D. $\frac{A}{\mu}$

Answer: B

Watch Video Solution

38. A concave mirrorr of focal length f_1 is placed at a distance of d from a convex lens of focal length f_2. A beam of light coming from infinity and falling on this convex lens-concave mirrorr combination returns to infinity. The distance d must equal.

A. $-2f_1 + f_2$

B. $f_1 + f_2$

C. $- f_1 + f_2$

D. $2f_1 + f_2$

Answer: D

Watch Video Solution

39. The magnifying power of a telescope is 9. When it is adjusted for parallel rays the distance between the objective and eyepiece is $20cm$. The focal lengths of lenses are

A. $11cm, 9cm$

B. $10cm, 10cm$

C. $15cm, 5cm$

D. $18cm, 2cm$

Answer: D

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40. For the angle of minimum deviation of a prism to be equal to its refracting angle, the prism must be made of a material whose refractive index

A. lies between $\sqrt{2}$ and 1

B. lies between 2 and $\sqrt{2}$

C. is less than 1

D. is greater than 2

Answer: B

Watch Video Solution

41. A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that the end closer to the pole is 20 cm away from it. Find the length of the image.

A. $10cm$

B. $15cm$

C. $2.5cm$

D. $5cm$

Answer: D

Watch Video Solution

42. A plano-convex lens fits exactly into a plano-concave lens. Their plane surfaces are parallel to each other. If the lenses are made of different material of refractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then focal length of the combination is

A. $\dfrac{R}{2(\mu_1 + \mu_2)}$

B. $\dfrac{R}{2(\mu_1 - \mu_2)}$

C. $\dfrac{R}{(\mu_1 - \mu_2)}$

D. $\dfrac{R}{(\mu_1 + \mu_2)}$

Answer: C

Watch Video Solution

43. For a normal eye, the cornea of eye provides a converging power of $40D$ and the least converging power of the eye lens behind the cornea is $20D$. Using this information, the distance between the retina and the cornea eye lens can be estimated to be

A. $5cm$

B. $2.5cm$

C. $1.67cm$

D. $1.5cm$

Answer: C

Watch Video Solution

44. If the focal length of the objective lens is increased then

A. Microscope will telescope both will decrease

B. Microscope and telescope both will increase

C. Microscope and telscope both will decrease

D. Microscope will decrease but that of telescope will increase.

Answer: D

Watch Video Solution

45. Angle of prism is A and its one surface is silvered. Light rays falling at an angle of incidence $2A$ on first surface return back through the same path after suffering reflection at second silvered surface.

Refraction index of the material of prism is

A. $2 \sin A$

B. $2 \cos A$

C. $\frac{1}{2} \cos A$

D. $\tan A$

Answer: B

Watch Video Solution

46. The refracting angle of a prism is A and refractive index of the material of the prism is $\cos(A/2)$. The angle of minimum deviation is

A. $180^\circ - 3A$

B. $180^\circ - 2A$

C. $90^\circ - A$

D. $180^\circ + 2A$

Answer: B

Watch Video Solution

47. Two identical thin planoconvex glass lenses (refractive index 1.5) each having radius of curvature of $20cm$ are placed with their convex surfaces in contact at the centre. The intervening space is filled with oil of refractive index 1.7. The focal length of the combination is

A. $-20cm$

B. $-25cm$

C. $-50cm$

D. $50cm$

Answer: C

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48. In an astronomical telescope in normal adjustment a straight black line of length L is drawn on inside part of objective lens. The eye piece forms a real image of this line. The length of this image is I. The magnification of the telescope is

A. $\dfrac{L}{I}$

B. $\dfrac{L}{I}+1$

C. $\dfrac{L}{I}-1$

D. $\dfrac{L+I}{L-I}$

Answer: A

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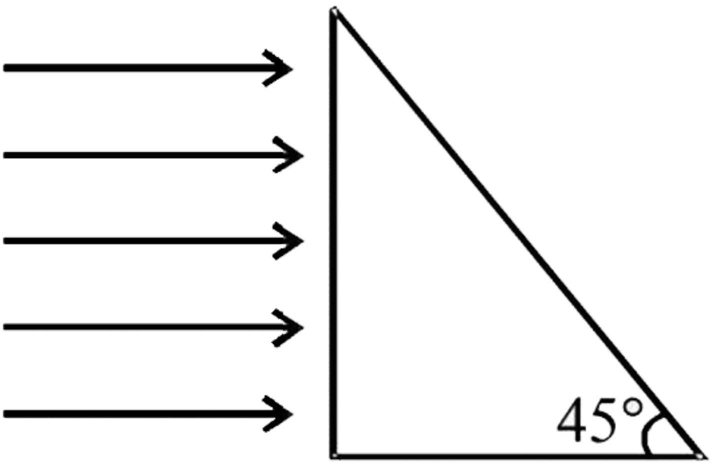
49. A beam of light consisting of red, green and blue colours is incident on a right angled prism, fig. The refractive indices of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively. The prism will `



A. separate the red colour apart from the green and blue colours

B. separate the blue colour apart from the red and green colours

C. separate all the three colours from one another

D. not separate the three colours at all

Answer: A

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50. The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are :

A. $45^\circ, \frac{1}{\sqrt{2}}$

B. $30^\circ, \sqrt{2}$

C. $45^\circ, \sqrt{2}$

D. $30^\circ, \frac{1}{\sqrt{2}}$

Answer: B

Watch Video Solution

51. An astronomical telesope has objective and eyepiece of focal lengths $40cm$ and $4cm$ respectively. To view an object $200cm$ away from the objective, the lenses must be separated by a distance :

A. $37.3cm$

B. $46.0cm$

C. $50.0cm$

D. $54.0cm$

Answer: D

Watch Video Solution

52. Two identical glass $(\mu_g = 3/2)$ equiconvex lenses of focal length f are kept in contact. The space between the two lenses is filled with water $(\mu_w = 4/3)$. The focal length of the combination is

A. $4f/3$

B. $3f/4$

C. $f/3$

D. f

Answer: B

Watch Video Solution

53. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is $5cm$ deep when viewed from one surface and $3cm$ deep when viewed from the opposite face. The thickness (in cm) of the slab is

A. 12

B. 16

C. 8

D. 10

Answer: A

Watch Video Solution

54. A person can see objects clearly only when they lie between $50cm$ and $400cm$ from his eyes. In order to increase the maximum distance of distinct vision to infinity, the type and power of the correcting lens, the person has to use, will be

A. concave, -0.2diopter

B. convex, $+0.15$ diopter

C. convex,$+2.25$ diopter

D. concave, -0.25diopter

Answer: D

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55. A beam of light from a source L is incident normally on a plane mirror fixed at a certain distance x from the source. The beam is reflected back as a spot on a scale placed just above the source L. When the mirror is rotated through a small angle θ, the spot of the light is found to move through a distance y on the scale. The angle θ is given by :

A. $\dfrac{y}{x}$

B. $\dfrac{x}{2y}$

C. $\dfrac{x}{y}$

D. $\frac{y}{2x}$

Answer: D

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56. A thin prism having refracting angle 10° is made of glass of refracting index 1.42. This prism is combined with another thin prism of glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of second prism should be :

A. 6°

B. 8°

C. 10°

D. 4°

Answer: A

Watch Video Solution

57. An object is placed at a distance of $40cm$ from a concave mirror of focal length $15cm$. If the object is displaced through a distance of

$20cm$ towards the mirror, the displacement of the image will be

A. $36cm$ towards the mirrorr

B. $30cm$ away from the mirrorr

C. $30cm$ towards the mirrorr

D. $36cm$ away from the mirrorr

Answer: D

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58. A glass prism has refractive index $\sqrt{2}$ and refracting angle 30° . One of the refracting surface of the prism is silvered. A beam of monchromatic light will retrace it path it its angle of incidence on the unsilvered refracting surface of the prism is

A. zero

B. 60°

C. 30°

D. 45°

Answer: D

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59. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

A. Small focal length and small diameter

B. Small focal length and large diameter

C. Large focal length and large diameter

D. Large focal length and small diameter

Answer: C

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60. The resolving lime of healthy eye is about

A. $1'$ or $\left(\frac{1}{60}\right)^{\circ}$

B. $1^{''}$

C. 1°

D. $\frac{1}{60}^{''}$

Answer: A

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61. A concave mirror of focal length $15cm$ forms an image having twice the linear dimensions of the object. The position of the object when the image is virtual will be

A. $22.5cm$

B. $7.5cm$

C. $40cm$

D. $30cm$

Answer: B

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62. Four lenses of focal length $+15cm, +20cm, +150cm$ and $+250cm$ are available for making an astronomical telescope. To produce the largest magnification, the focal length of the eye-piece should be

A. $+250cm$

B. $+155cm$

C. $+15cm$

D. $25cm$

Answer: C

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63. A ray of light is incident on the surface of plate of glass of refractive index 1.5 at the polarising angle. The angle of refraction of the ray will be

A. 33.7°

B. 23.7°

C. 43.7°

D. 53.7°

Answer: B

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64. An astronaut is looking down on earth's surface from a space shuttle at an altitude of $400 km$. Assuming that the astronaut's pupil diameter is $5 mm$ and the wavelength of visible light is $500 nm$. The astronaut will be able to resolve linear object of the size of about .

A. $0.5 m$

B. $5 m$

C. $50 m$

D. $500m$

Answer: C

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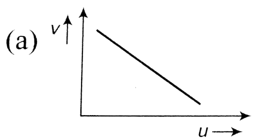
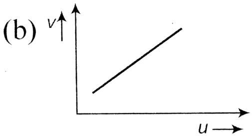
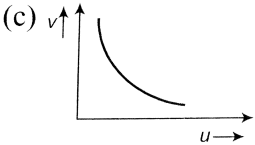
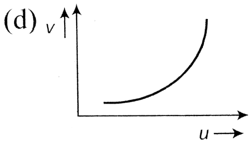
65. In an experiment to find focal length of a concave mirror, a graph is drawn between the magnitudes of (u) and (v). The graph looks like.

A. 

B. 

C. 

D. 

Answer: C

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66. An object is immersed in a fluid. In order that the object becomes invisible, it should

A. behave as a perfect reflector

B. have refractive index exactly matching with that of the surrounding fluid

C. absorb all light falling on it

D. have refractive index one

Answer: B

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67. An endoscope is employed by a physician to view the internal parts of body organ. It is based on the principle of

A. total internal reflection

B. refraction

C. reflection

D. dispersion

Answer: A

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68. A telescope has an objective lens of focal length $200cm$ and an eye piece with focal length $2cm$. If this telescope is used to see a 50 meter tall building at a distance of $2km$, what is the height of the image of the building formed by the objective lens?

A. $5cm$

B. $10cm$

C. $1cm$

D. $2cm$

Answer: A

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69. The apparent depth of water in cylindrical water tank of diameter $2Rcm$ is reducing at the rate of $xcm / \min$ when water is being drained out at a constant rate. The amount of water drained in $c.c.$ per minute is ($n_1 =$ refractive index of air, $n_2 =$ refractive index of water)

A. $x\pi R^2 n_1 / n_2$

B. $x\pi R^2 n_2 / n_1$

C. $2\pi R n_1 / n_2$

D. $\pi R^2 x$

Answer: B

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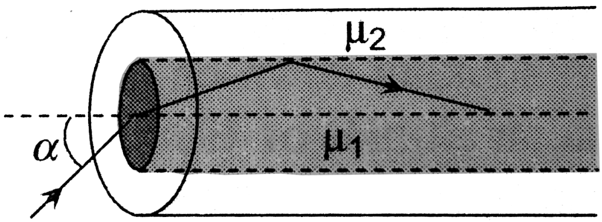
70. An optical fiber consists of core of μ_1 surrounded by a cladding of $\mu_2 < \mu_1$. A beam of light enters from air at an angle α with axis of fiber. The highest α for which ray can be travelled through fiber is



A. $\cos^{-1}\sqrt{\mu_2^2 - \mu_1^2}$

B. $\sin^{-1}\sqrt{\mu_1^2 - \mu_2^2}$

C. $\tan^{-1}\sqrt{\mu_1^2 - \mu_2^2}$

D. $\sec^{-1}\sqrt{\mu_1^2 - \mu_2^2}$

Answer: B

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71. In refraction, light waves are bent on passing from one medium to the second medium, because, in the second medium

A. the speed is different

B. the frequency is different

C. the coefficient of elasticity is different

D. the amplitude is smaller

Answer: A

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72. A wire mesh consisting of very small squares is viewed at a distance of $8cm$ through a magnifying converging lens of focal length $10cm$, kept close to the eye. The magnification produced by the lens is:

A. 8

B. 20

C. 10

D. 5

Answer: D

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73. A lens is made of flint glass (refractive index $= 1.5$). When the lens is immersed in a liquid of refractive index 1.25 , the focal length:

A. increases by a factor of 1.25

B. increases by a factor of 1.2

C. decreases by a factor of 1.2

D. increases by a factor of 2.5

Answer: D

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74. In a compound microscope, the focal length of the objective and the eye lens are $2.5cm$ and $5cm$ respectively. An object is placed at $3.75cm$ before the objective and image is formed at the least distance of distinct vision, then the distance between two lenses will be $(i.e.$ length of the microscope tube)

A. $11.67cm$

B. $12.67cm$

C. $13.00cm$

D. $12.00cm$

Answer: A

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75. A thin glass (refractive index 1.5) lens has optical power of $-5D$ in air. Its optical power in a liquid medium with refractive index 1.6 will be

A. $25D$

B. $-1D$

C. $1D$

D. $-25D$

Answer: C

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76. A fish looking up through the water sees the outside world contained in a circular horizon. If the refractive index of water is $\frac{4}{3}$ and the fish is 12 cm below the surface, the radius of this circle is cm is

A. $36\sqrt{7}$

B. $36\sqrt{5}$

C. $\frac{36}{\sqrt{7}}$

D. $4\sqrt{5}$

Answer: C

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77. A beam of light propagating in medium A with index of refraction $n(A)$ passes across an interface into medium B with index of refraction $n(B)$. If $v(A)$ and $v(B)$ are the speeds of light in A and B respectively. Then which of the following is true?

A. $v(A) > v(B)$ and $n(A) > n(B)$

B. $v(A) > v(B)$ and $n(A) < n(B)$

C. $v(A) < v(B)$ and $n(A) > n(B)$

D. $v(A) < v(B)$ and $n(A) < n(B)$

Answer: B

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78. A microscope is focused on a coin lying at the bottom of a beaker. The microscope is now raised up by $1cm$. To what depth should the water be poured into the beaker so that coin is again in focus ? (Refractive index of water is $4/3$)

A. $1cm$

B. $4/3cm$

C. $3cm$

D. $4cm$

Answer: D

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79. A diver in a swimming poole wants to signal his distress to a person lying on the edge of the pool by flashing his water proof flash light

A. He must direct the beam vertically upwards

B. He has to direct the beam horizontally

C. He has to direct the beam at an angle to the vertical which is slightly less than the cirtical angle of incidence for total internal reflection.

D. He has to direct the beam at an angle to the vertical which is slightly more than the critical angle of incidence for the total internal reflection.

Answer: C

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80. A ray of monochromatic light is incident on one refracting face of a prism of angle 75°. It passes through the prism and is incident on the other face at the critical angle. If the refractive index of the material of the prism is $\sqrt{2}$, the angle of incidence on the first face of the prism is

A. 30°

B. 45°

C. 60°

D. 0°

Answer: B

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81. A combination of two thin lenses with focal lengths f_1 and f_2 respectively forms and image of distant object at distance $60cm$ when lenses are in contact. The position of this image shifts by $30cm$ towards the combination when two lenses are separated by $10cm$. The corresponding values of f_1 and f_2 are

A. $30cm, \ -60cm$

B. $20cm, \ -30cm$

C. $15cm, \ -20cm$

D. $20cm, \ -15cm$

Answer: B

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82. A thin made of glass of refractive index 1.5 has a front surface $+11D$ power and back surface $-6D$. If this lens is submerged in a liquid of refractive index 1.6, the resulting power of the lens is

A. $-0.5D$

B. $+0.5D$

C. $-0.625D$

D. $+0.625D$

Answer: C

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83. A thin prism P_1 with angle $4 degree$ and made from glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation. The angle of the prism P_2 is

A. 3°

B. 5.33°

C. 2.6°

D. 4°

Answer: A

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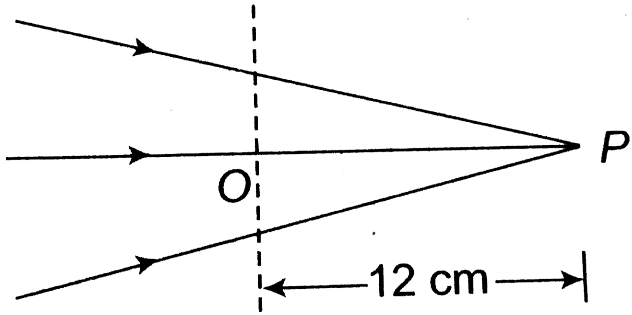
84. Figure given below shows a beam of light converging at point P. When a convex lens of focal length $16cm$ is introduced in the path of the beam at a place O shown by dotted line such that OP becomes the axis of the lens, the beam converges at a distance x from the lens. The value x will be equal to



A. $12cm$

B. $24cm$

C. $36cm$

D. $48cm$

Answer: D

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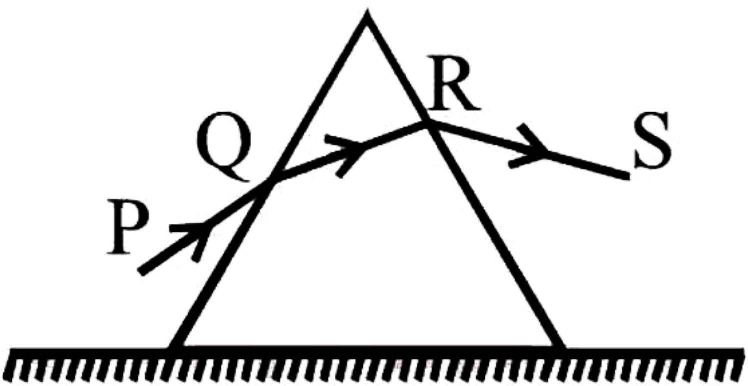
85. An equilateral prism is placed on a horizontal surface. A ray PQ is incident onto it. For minimum deviation `



A. PQ is horizontal

B. QR is horizontal

C. RS is horizontal

D. Either PQ or RS is horizontal

Answer: B

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86. In a laboratory four convex lenses L_1, L_2, L_3 and L_4 of focal lengths $2, 4, 6$ and $8cm$ respectively are available. Two of these lenses form a telescope of length $10cm$ and magnifying power 4 . The objective and eye lenses are

A. L_2, L_3

B. L_1, L_4

C. L_3, L_2

D. L_4, L_1

Answer: D

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87. The average distance between the earth and moon is $3.86 \times 10^4 km.$ The minimum separation between the two points on the surface of the moon that can be resolved by a telescope whose objective lens has a diameter os $5m$ with $\lambda = 6000\text{Å}$ is

A. $5.65m$

B. $28.25m$

C. $11.30m$

D. $56.51m$

Answer: D

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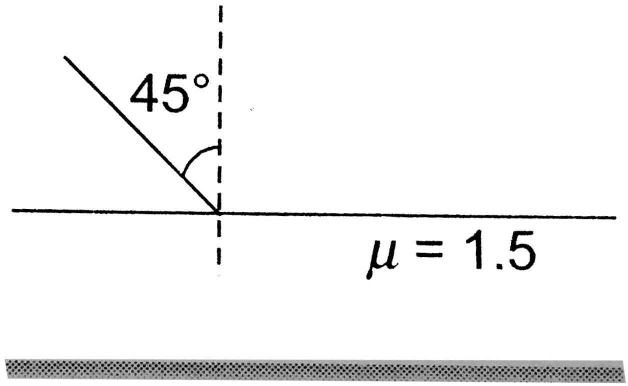
88. One side of a glass slab is silvered as shown. A ray of light is incident on the other side at angle of incidence $i = 45^\circ$. Refractive index of glass is given as 1.5. The deviation of the ray of light from its initial path when it comes out of the slab is



A. 90°

B. 180°

C. 120°

D. 45°

Answer: A

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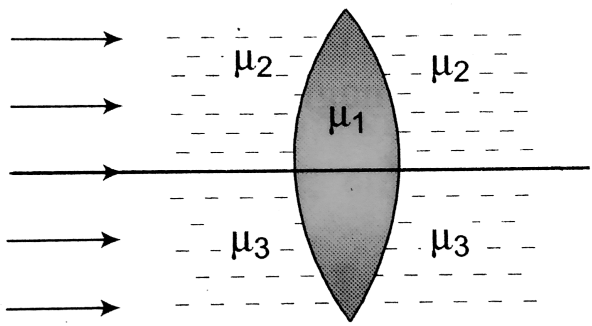
89. A double convex lens, lens made of a material of refractive index μ_1, is placed inside two liquids or refractive indices μ_2 and μ_3, as shown. $\mu_2 > \mu_1 > \mu_3$. A wide, parallel beam of light is incident on the lens from the left. The lens will give rise to



A. a single convergent beam

B. two different convergent beams

C. two different divergent beams

D. a convergent and a divergent beam

Answer: D

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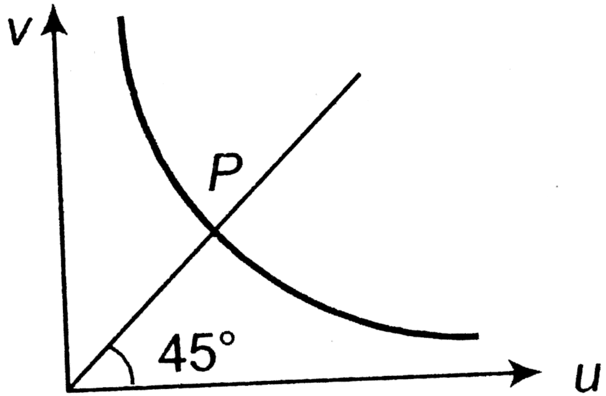
90. The graph shows variation of v with change in u for a mirrorr. Points plotted above the point P on the curve are for values of v



A. smaller than f

B. smaller than $2f$

C. larger than $2f$

D. larger than f

Answer: C

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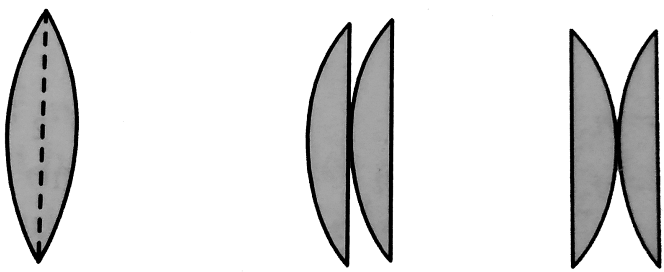
91. Two similar planoconvex lenses are combined together in three different ways as shown in the adjoining figure. The ratio of the focal lengths in three cases will be



A. $2:2:1$

B. $1:1:1$

C. $1:2:2$

D. $2:1:1$

Answer: B

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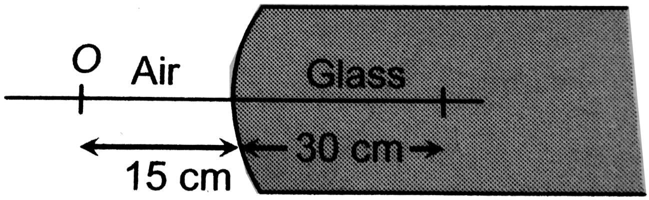
92. A point object O is placed in front of a glass rod having spherical end of radius of curvature $30cm$. The image would be formed at



A. $30cm$ left

B. Infinity

C. $1cm$ to the right

D. $18cm$ to the left

Answer: A

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93. A $2.0cm$ tall object is placed $15cm$ in front of concave mirrorr of focal length $10cm$. The size and nature of the image will be

A. $1.0cm$, real

B. $4cm$, virtual

C. $4cm$, real

D. none of these

Answer: C

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94. A person can see clearly only up to a distance of $25cm$. He wants to read a book placed at a distance of $50cm$. What kind of lens does he require for his spectacles and what must be its power ?

A. Concave, $-1.0D$

B. Convex , $+1.5D$

C. Concave, $-2.0D$

D. Convex, $+2.0D$

Answer: C

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95. In a simple microscope of focal length $5cm$ final image is formed at D, then its magnification will be

A. 6

B. 5

C. 2

D. 1

Answer: A

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Assertion Reason

1. Assertion : In a movie, ordinarily 24 frames are projected per second from one end to the other of the complete film.

Reason : The image formed on retina of eye is sustained up to $1/10s$ after the removal of stimulus.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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2. Assertion : Blue colour of sky appears due to scattering of blue colour.

Reason : Blue colour has shortest wave length in visible spectrum.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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3. Assertion : The air bubble shines in water.

Reason : Air bubble in water shines due to refraction of light.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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4. Assertion : The stars twinkle while the planets do not.

Reason : The stars are much bigger in size than the planets.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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5. Assertion : Owls can move freely during night.

Reason : They have large number of rods on their retina.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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6. Assertion : In optical fiber, the diameter of the core is kept small.

Reason : This smaller diameter of the core ensures that the fiber should have incident angle more than the critical angle required for total internal reflection.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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7. Assertion : A concave mirror and convex lens both have the same focal length in air. When they are submerged in water, they will have same focal length.

Reason refractive index of water is smaller than be refractive index of air.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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8. In each of the questions, assertion(A) is given by corresponding statement of reason (R) of the statemens. Mark the correct answer.

Q. Statement I: The formula connecting u,v and f for a spherical mirror is valid only for mirrors whose sizes are very small compared to their radii of curvature.

Statement II: Laws of reflection are strictly valid for plane surfaces, but not for large spherical surfaces.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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9. Assertion : The setting sun apears to be red.

Reason : Scattering of light is directly proportional to the wavelength .

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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10. Assertion : A double convex lens $(\mu = 1.5)$ has focal length $10cm$. When the lens is immersed in water $(\mu = 4/3)$ its focal length becomes $40cm$.

Reason : $\frac{1}{f} = \frac{\mu_1 - \mu_m}{\mu_m}\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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11. Assertion : The colour of the green flower seen through red glass appears to be dark.

Reason : Red glass transmits only red light.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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12. Assertion : The focal length of the mirror is f and distance of the object from the focus is u, the magnification of the mirror is f/u.

Reason : Magnification $= \frac{\text{Size of the image}}{\text{Size of object}}$

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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13. Assertion : Dispersion of light occurs because velocity of light in a material depends upon its colour.

Reason : The dispersive power depends only upon the material of the prism, not upon the refracting angle of the prism

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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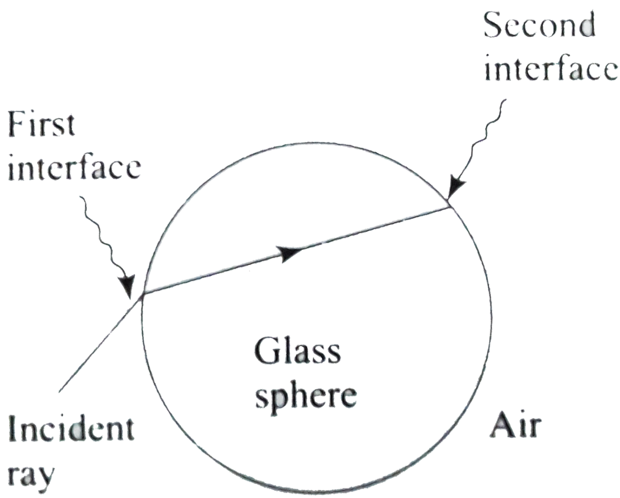
14. Statement I: A ray is incident from outside on a glass sphere surrounded by air as shown in Figure. This ray may suffer total internal reflection at the second interface.



Statement II: For a ray going from a denser to rarer medium, the ray may suffer total internal reflection.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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15. Assertion : Rainy clouds appear dark from below.

Reason : There is not sufficient light which can be scattered by these clouds.

A. If both the assertion and reason are true and reason explains the assertion.

B. If both the assertion and reason are true but reason does not explain the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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Section D - Chapter End Test

1. Wavelength of light used in an optical instrument are $\lambda_1 = 400\text{Å}$ and $\lambda_2 = 5000\text{Å}$, then ratio of their respective resolving power (corresponding to λ_1 and λ_2) is

A. $16:25$

B. $9:1$

C. $4:5$

D. $5:4$

Answer: D

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2. A plano convex lens of refractive index 1.5 and radius of curvature 30cm. Is silvered at the curved surface. Now this lens has been used to form the image of an object. At what distance from this lens an object be placed in order to have a real image of size of the object.

A. $20cm$

B. $30cm$

C. $60cm$

D. $80cm$

Answer: A

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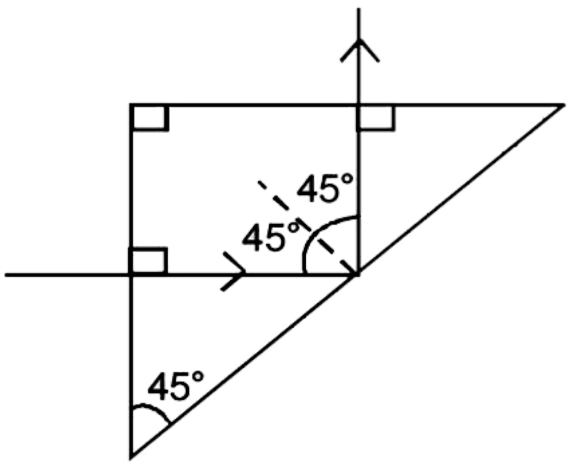
3. A light ray is incident perpendicularly to one face of a 90° prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45°, we conclude that the refractive index n



A. Less than 1.41

B. Equal to 1.41

C. Greater than 1.41

D. None of these

Answer: C

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4. A thin glass (refractive index 1.5) lens has optical power of $-5D$ in air. Its optical power in a liquid medium with refractive index 1.6 will be

A. $25D$

B. $-25D$

C. $1D$

D. None of these

Answer: D

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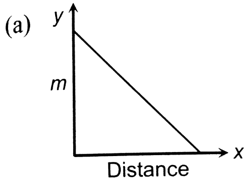
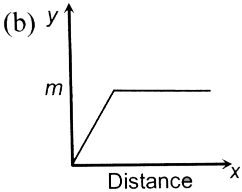
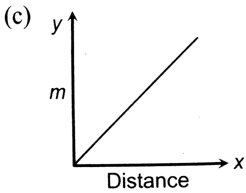
5. Which of the following graphs is the magnification of a real image against the distance from the focus of a concave mirrorr ?

A. 

B. 

C. 

D. 

Answer: D

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6. A thin prism P_1 with angle $4 degree$ and made from glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation. The angle of the prism P_2 is

A. 2.6°

B. 3°

C. 4°

D. 5.33°

Answer: B

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7. A converging lens is used to form an image on a screen. When the upper half of the lens is covered by an opaque screen

A. Half the image will disappear

B. Complete image will be formed of same intensity

C. Half image will be formed of same intensity

D. Complete image will be formed of decreased intensity.

Answer: D

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8. A diminished image of an object is to be obtained on a screen 1.0 m from it. This can be achieved by appropriately placing

A. A convex mirror of suitable focal length

B. A concave mirrorr of suitable focal length

C. A concave lengs of suitable focal length

D. A convex lens of suitable focal length less than $0.25m$

Answer: D

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9. An object 15cm high is placed 10cm from the optical center of a thin lens. Its image is formed 25cm from the optical center on the same side of the lens as the object . find the height of image

A. $2.5cm$

B. $0.2cm$

C. $16.7cm$

D. $37.5cm$

Answer: D

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10. A lens forms a virtual, diminished image of an object placed at $2m$ from it. The size of image is half of the object. Which one of the following statements is correct regarding the nature and focal length of the lens ?

A. Concave $|f| = 1m$

B. Convex, $|f| = 1$

C. Concave,$|f| = 2m$

D. Convex, $|f| = 2m$

Answer: C

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11. When the distance between the object and the screen is more than $4f$. We can obtain image of the object on the screen for the two positions of the lens. If is called displacement method. In one case, the image is magnified and in the other case, it is diminished. If I_1 and

I_2 be the sized of the two images, then the size of the object is

A. $\sqrt{I_1 I_2}$

B. $\sqrt{\dfrac{I_1}{I_2}}$

C. $I_1 - I_2$

D. $\dfrac{I_1 + I_2}{2}$

Answer: A

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12. a convex lens of power $+6$ diopter is placed in contact with a concave lens of power -4 diopter. What will be the nature and focal length of this combination?

A. Concave, $25cm$

B. Convex, $50cm$

C. Concave, $20cm$

D. Convex, $100cm$

Answer: B

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13. A concave lens of focal length 20 cm product an image half in size of the real object. The distance of the real object is

A. $20cm$

B. $30cm$

C. $10cm$

D. $60cm$

Answer: A

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14. A convex lens of focal length 1.0m and a concave lens of focal length 0.25m are 0.75m apart. A parallel beam of light is incident on the convex lens. The beam emerging after refraction from both lenses is

A. Parallel to principle axis

B. Convergent

C. Divergent

D. None of the above

Answer: A

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15. If in a planoconvex lens, the radius of curvature of the convex surface is $10cm$ and the focal length is $30cm$, the refractive index of the material of the lens will be

A. 1.5

B. 1.66

C. 1.33

D. 3

Answer: C

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16. A convex lens A of focal length 20cm and a concave lens G of focal length 5cm are kept along the same axis with the distance d between them. If a parallel beam of light falling on A leaves B as a parallel beam, then distance d in cm will be

A. 25

B. 15

C. 30

D. 50

Answer: B

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17. The radii of curvature of the two surfaces of a lens are $20cm$ and $30cm$ and the refractive index of the material of the lens is 1.5. If the lens is concave — convex, then the focal length of lens is

A. $24cm$

B. $10cm$

C. $15cm$

D. $120cm$

Answer: D

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18. A lens forms a virtual image $4cm$ away from it when an object is placed $10cm$ away from it. The lens is a ..... Lens of focal length ....

A. concave, $6.67cm$

B. concave, $2.86cm$

C. convex, $2.86cm$

D. may be concave or convex, $6.67cm$.

Answer: A

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19. A concave lens of focal length $\frac{1}{3}m$ forms a real, inverted image twice in size of the object. The distance of the object from the lens is

A. $0.5m$

B. $0.166m$

C. $0.33m$

D. $1m$

Answer: A

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20. An object is placed at a distance of $f/2$ from a convex lens. The image will be

A. at one of the foci, virtual and double its size

B. at $\frac{3f}{2}$, real and inverted

C. at $2f$, m virtual and erect

D. none of these

Answer: A

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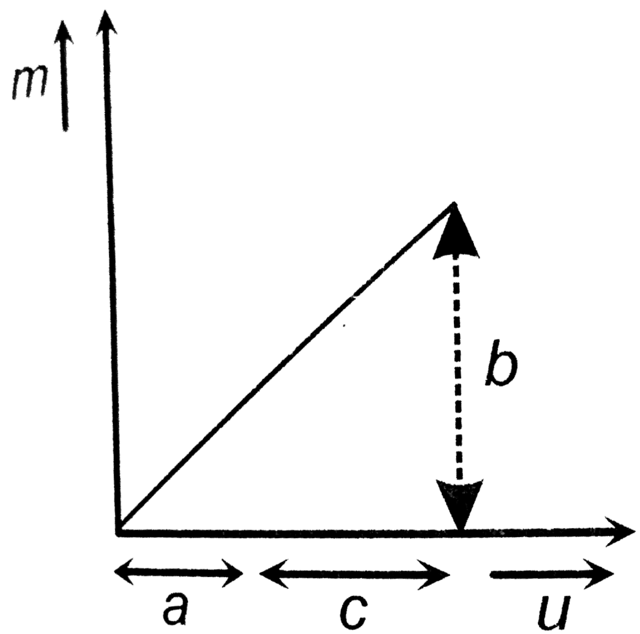
21. The graph shows how the magnification m produced by a convex thin lens varies with image distance v. What was the focal length of the used ?



A. $\dfrac{b}{c}$

B. $\frac{b}{ca}$

C. $\frac{bc}{a}$

D. $\frac{c}{b}$

Answer: D

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22. A convex lens forms an image of an object placed 20cm away from it at a distance of 20cm on the other side of the lens. If the object is moves 5cm toward the lens, the image will be

A. $5cm$ towards the lens

B. $5cm$ away from the lens

C. $10cm$ towards the lens

D. $10cm$ away from the lens

Answer: D

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23. A converging lens is to projected image of a lamp 4 times the size of the lamp on a wall at a distance of $10m$ from the lamp. The focal length of the lens is

A. $1.6m$

B. $2.67m$

C. $4.4m$

D. $-1.6m$

Answer: A

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24. A thin lens produces an upright image of the same size as the object. Then from the optical centre of the lens, the distance of the object is .

A. Zero

B. $4f$

C. $2f$

D. $\frac{f}{2}$

Answer: A

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25. A convex lens of focal length $10cm$ and concave lens of focal length $20cm$ are kept $5cm$ apart. The focal length of the equivalent lens is

A. $\frac{120}{3}cm$

B. $18cm$

C. $30cm$

D. $\frac{40}{3}$

Answer: D

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26. The focal lengths of the objective and eye $-$ lens of a microscope are $1cm$ and $5cm$ respectively. If the magnifying power for the relaxed eye is 45, then the length of the tube is

A. $6cm$

B. $9cm$

C. $12cm$

D. $15cm$

Answer: D

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27. A microscope has an objective of focal length $1.5cm$ and eye piece of focal length $2.5cm$. If the distance between objective and eyepiece is $25cm$. What is the approximate value of magnification produced for relaxed eye ?

A. 75

B. 110

C. 140

D. 25

Answer: C

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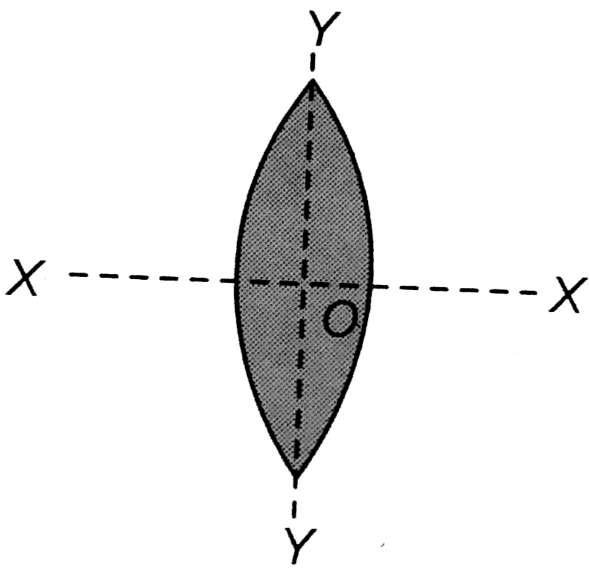
28. An equiconvex lens is cut into two halves along $(i) XOX'$ and $(ii) YOY'$ as shown in the figure. Let $f, f' f''$ be the focal lengths of the complete lens, of each half in case (i), and of each half in case (ii), respectively

Choose the correct statement from the following



A. $f^{'} = f, f^{' '} = 2f$

B. $f^{'} = 2f, f^{' '} = f$

C. $f^{'} = f, f^{' '} = f$

D. $f^{'} = 2f, f^{' '} = 2f$

Answer: A

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29. Assertion : For the sensitivity of a camera, its aperture should be reduced

Reason : Smaller the aperture, image focussing is also sharp.

A. If both the assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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30. Assertion : The mirrors used in search lights are parabolic and not concave spherical. Reason : In a concave spherical mirror the image formed is always virtual.

A. If both the assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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